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WE take much pleasure in calling attention to the opening of classes in architecture, in connection with the Art Institute of Chicago, on Van Buren Street, near Michigan Avenue. The school year is from September 27 to June 7, with an intermission of a week at the holidays, and the work of the classes extends through the day and evening, so that an earnest student has an opportunity to learn a great deal in the two years which is considered by the instructors the shortest period in which any considerable part of the course can be accomplished. The regular instruction is at present under the charge of Mr. Louis J. Millet and Mr. William A. Otis, and lectures are to be given by Professor W. L. B. Jenney, Mr. John W. Root, Mr. D. H. Burnham, Mr. I. K. Pond, Mr. J. M. Ewen, and perhaps others. The names of these brilliant and accomplished architects among the lecturers is alone enough to show that the new school aims at the best professional teaching that can be given, and understands what must be done to form a course of thorough and solid training in the art, and the details of the scheme only need to be worked out as circumstances may indicate. It is a great advantage for the school that, being a department of the Art Institute, its students enjoy the almost inestimable privilege of drawing, painting and modelling to any extent that their leisure or ambition may dictate, with the classes in the other departments; and it is no less an advantage that so many of the ablest men in the profession in the city should have been enlisted, at the outset, in the task of guiding the development of the plan of instruction. To a school of architecture commencing its existence under such auspices all things are possible, and the men who have made Chicago artistically one of the most interesting places in the country could do nothing more honorable to themselves than to promote in every possible way the true interest of the school where the talents of their successors are to be developed. Students who propose to enter the school should apply to Mr. N. H. Carpenter, Secretary, at the Art Institute, Van Buren Street, for such further information as they need, and are particularly requested to send in their names, if possible, a week before the beginning of the term.

M. RIVOALEN, in the *Encyclopédie d'Architecture*, makes some valuable observations on the use of concrete in connection with iron in floors. He mentions that, a few years ago, M. Dupuis built a Catholic book-store in the Rue des Saints Pères, in Paris, the floors of which, twenty-six feet in span, were covered with segmental vaults of concrete containing a skeleton of iron I-beams. As architects know, the loads on the floor of a book-store are often very great, and, as they are frequently moved, the strain which they impose on the construction may be serious; but these concrete floors, although not heavy, have shown themselves very strong and stiff, far more so, in fact, than a floor would have been if laid with a similar number and size of I-beams, filled in with brick or terra-cotta arch-blocks. It is about fifteen years since Mr. Thaddeus Hyatt called attention to the property possessed by Portland-cement concrete, of attaching itself so strongly to iron that a beam might be composed of the concrete, having iron bars laid in the lower portion, which would combine the tensile strength of the iron in the lower part, and the resistance to compression of the concrete in the upper part, in a resistance to bending which would be due to the joint action of the two forces, and would almost infinitely surpass the transverse strength of either part of the compound beam, taken separately. Mr. Hyatt gave up for a time his experiments on this subject to devote himself to a process of making Portland cement secure against injury from fire by mixing sulphur with it; but, in a rather irregular and feeble way, many other persons have found that an iron skeleton, filled in with such concrete, gave an unexpectedly strong and durable construction, while the alkalinity of the cement keeps the iron buried in it, free from rust, for an indefinite period.

IN December last the Iowa Soldiers' Monument Commission advertised for competitive designs for a monument to be erected at Davenport, and as the invitation contained the statement that the commission reserved the right to "reject any or all drawings if in the judgment of a majority of its members none shall be of sufficient architectural excellence to merit a prize," we have no sympathy to waste on those who took part in it. Between the time of the close of the competition in April and the deciding of the contest, a few weeks ago, we received several inquiries from competitors who desired to know what was going on; and since the competition was decided we have received other letters from architects asking why their drawings were not returned, and from others complaining that they had been returned, but unaccompanied by even the cheap courtesy of a word of thanks or a statement as to how the affair had resulted. Such treatment is so usual that we wonder that architects who are willing to be bought and sold at the valuation any commission may put on them should think it worth while to lift up their voices in protest. As usual, home talent won, but the award had this of unusual about it, the successful competitor was a woman, Mrs. Harriet A. Ketcham, of Mt. Pleasant, Io., who is said, by those who saw the design, to have submitted a rather crude sketch of a monument closely following Rauch's great monument to Frederick the Great at Berlin, a very good model, perhaps, but one rather difficult to execute for the sum of $100,000 as fixed by the commission. Rauch's monument, which was made thirty years ago, in a country where labor was cheap and the needful facilities at hand, cost $187,000, and to-day it would probably cost $250,000 to do a similar work in Germany. On another page will be found the second prize design, and we can only regret that we are unable to show Mrs. Ketcham's design at the same time.

ARCHITECTS who have observed the construction of the so-called "Spanish vaults," of flat tiles, which are coming into rather extensive use about New York and Boston, will be interested to learn how far the system is a revival of a very ancient one. Professor Aitchison, in his Royal Academy lectures on Roman construction, mentions many instances where domes and barrel-vaults, both semicircular and segmental, were built of tiles laid flat, in two or three courses, breaking joint, and the haunches afterward filled up with rubble or concrete, and, to show that the tradition of this sort of work still persists in Italy, he says that in 1854, being near Florence, he saw a segmental barrel-vault, about eighteen feet in span, turned with a single course of tiles, set in plaster-of-Paris. No centering was used, "turning pieces" were set about six feet apart to give the form of the arch, and the workman held each tile in his hands until the plaster-of-Paris had set. The haunches were stiffened by small vaults, turned in the same way, and it was intended to concrete up the haunches, and lay a mosaic floor over the vault. The workmen told him that this construction was called "Volterran vaulting," and it seems to have anticipated in nearly every detail the "Spanish" vaulting of our day, in which plaster-of-Paris is also used for

jointing the first course, and with the same object, to enable the workmen to lay the tiles with a light portable centering, which, through the almost instantaneous setting of the plaster-of-Paris, can be shifted as the work progresses. Of course, the antiquity of the device does not lessen the value of the modern form, which, although it involves a great deal of ingenious and skilful adaptation to the requirements and materials of the present day, modestly disclaims any pretence of being more than a revival of an ancient mode of construction.

A CURIOUS experiment in railway management went into operation on the first of August, in Hungary. Most of the Hungarian railroads belong to the Government, and, through the advocacy of Dr. Engel, who has studied their operation very carefully, a plan has been carried out by the Hungarian Minister of Communications, M. Baross, by which the territory served by the Government lines, this being practically the whole of Hungary, is divided into zones, with the idea of making the price of tickets the same for any station in a given zone. As yet, the new principle has not been carried out to its perfectly radical conclusion, and two sets of zones are established, one called the local zones, and the other the general zones. In the local zones, the fare from one station to the next is the same, whatever may be the distance between the stations, the prices being set at twelve cents for first-class tickets, six cents for second-class, and four cents for third-class. As the stations in the remote districts are often ten or fifteen miles apart, the effect is to make travelling on the unfrequented routes much cheaper than in the more densely populated districts, although the fares, even in these, are moderate, according to our notions. From any station in the local zones to the next station but one, the fares are sixteen, nine and six cents, irrespective of the distance.

FOR general travel, the whole railway system is divided into fourteen zones, which are, so to speak, migratory, any given point being the centre of the system of zones for travellers starting from that point. Beginning at this centre, a circle with a radius of twenty-five kilometres, or fifteen miles and a half, forms the first zone. The annular space between this circle and another, having a radius of two hundred and twenty-five kilometres, or a hundred and forty miles, is divided into twelve zones; and the fourteenth zone comprises all the places within the railway territory beyond the circumference of the thirteenth. The fare from any zone to the next is twenty cents for first-class, sixteen for second-class, and ten for third-class; so that the traveller in the second-class cars, which are better than our ordinary cars, rides his first fifteen and a half miles for sixteen cents, but pays the same for each succeeding stage of ten miles until he reaches his fourteenth zone, where the distance he can go for the same price varies according to circumstances. All this seems very simple, but in practice the new system amounts to a complete revolution in the ordinary system of passenger tariffs. In all other European countries, as well as here, the practice is to carry passengers in the neighborhood of the large cities, where trains run frequently, and are crowded with people, very cheaply, while the unfortunate persons who live on the sparsely-settled routes are made to pay enormous prices for the privilege of riding in the few trains allotted to them. The same rule was followed in Hungary until Dr. Engel made a thorough examination of the results of the practice, collecting some curious statistics. He found that, taking the German railroad system as an example, the first-class cars run, on an average, with nine-tenths of their seats empty. In the second-class, four-fifths of the seats are unoccupied; and in the third-class about two-thirds. Comparing these figures with the weights of cars and trains, he found that the railway companies, for the sake of conveying one first-class passenger and his hand-bag, hauled, on an average, a dead weight of more than three tons; every second-class passenger rode on a ton and a half of expensive material, and every third-class passenger required more than one ton. Moreover, the cost of maintaining the road-bed, salaries of officials and interest on capital, was about the same for conveying one passenger to every ten seats in the trains as it would be if all were occupied; and the obvious conclusion was that if, by a change in the tariffs, four or five persons could be induced to ride in the sparsely-settled districts, where one rode before, the railways would make a profit with a greatly reduced rate of fare. Incidentally, therefore, the new system, while simplifying and equalizing rates, materially reduces the cost of travelling long distances. For example, the distance from Budapest to Fiume, on the Adriatic, is three hundred and sixty-one miles. A part of the route is apparently beyond the jurisdiction of the Hungarian railway administration, for the first-class fare is now three dollars and forty cents, while, if it had been all within Hungarian territory, nearly two-thirds of the distance would have been in the fourteenth zone, and the fare would be two dollars and eighty cents. Before the first of August the fare was fifteen dollars and twenty cents. So, from Budapest to Brasso, in Transylvania, the road is nearly all over Government lines. The distance is four hundred and fifty-three miles, and the first-class fare is three dollars, only twenty cents more than it costs to travel to the boundary of the fourteenth zone, a hundred and forty miles from the point of departure. The second-class fare is two dollars and forty cents. A variation is made in the uniformity of the tariff, by providing that when the route taken by any traveller passes through Budapest, he shall be considered as starting on a fresh series of zones from that point, but this is probably only for convenience in reckoning the price of tickets, and rather reduces the cost of the journey. Baggage is subjected to a tariff by distance and weight. No baggage is conveyed free, and any quantity desired can be taken, at the uniform charge of fifty centimes for every fifty kilogrammes for each fifty kilometres, or ten cents for one hundred and thirty-five pounds carried thirty-one miles. It is easy to see that, besides the revenue from the new baggage tariffs, which will be considerable, the trebling or quadrupling of the long-distance passenger business would make the profits greater at the low fares than they have been at the high ones, and Dr. Engel hopes it may prove, as it has in the postal service, that the increase will be so great as to more than make good the apparent sacrifice. So far, as *Le Génie Civil* says, the event seems to show the correctness of his views. Within the first few days after the first of August, the traffic on the long lines increased enormously. Where the average daily number of passengers arriving in Budapest over certain routes had been twelve thousand, it increased in two or three days to thirty thousand, so that some of the express trains were received in three sections, and there were not cabs enough in the city to take the passengers from the station. The railways throughout Hungary, not under Government control, seeing that they could not compete with the State roads, have given notice that they will also adopt the Government zones and prices; and *Le Génie Civil* believes that it will not be long before Austria, finding that people can go from Venice or Brindisi to Berlin through Hungary for half what it would cost to go through Austria, will be forced to follow suit; and perhaps the lines through the other portions of the Continent may find it for their interest to join.

AT a recent reunion of army officers at Odessa, one of the chief surgeons presented some statistics in regard to the Franco-Prussian War which we have never seen before. According to him, one million, one hundred and thirteen thousand, two hundred and fifty-four privates, and thirty-three thousand, one hundred and one officers, crossed the German frontier into France in 1870-71. Of these, one hundred and thirteen thousand, eight hundred and twenty-one were wounded, and four hundred and seventy-five thousand were taken sick. Seventeen thousand, two hundred and fifty-five, or only one and one-half per cent, were left dead on the field of battle, and eleven thousand and twenty-three died subsequently of their wounds; making twenty-eight thousand, two hundred and seventy-eight, or about two and one-quarter per cent of the invaders who died by the arms of the French; while fourteen thousand, six hundred and forty-eight died from diseases. Considering that the war lasted nearly two years, the total mortality, of about forty in a thousand, does not seem very frightful. Many a civilized city keeps up a yearly average of twenty-two or twenty-three deaths to each thousand inhabitants, and, although the German soldiers were men in the best of health, and admirably taken care of, so that the mortality among them should be very low, it is, at first sight, rather startling to discover that the mortality incident to the most important war which perhaps ever took place in Europe, was apparently no greater than would have resulted from putting the troops to live during the same space of time in New York tenement houses or in the poorer quarters of Paris.

BUILDERS' HARDWARE.[1] — XXXIII.

HARDWARE SPECIFICATIONS.

Column in the Court of the Residenz, Freising.

THERE are three methods of specifying the hardware to be used about a building. The first, followed very generally in Boston, is by allowances, the general specification containing clauses to the effect that the contractor is to allow so much per door and so much per window for hardware. It is well, in order to prevent mistakes or disputes, to add that the allowances are to cover the net cost to the builder, and that all the hardware is to be set by the contractor in addition to the prices named. This method conveniently disposes of the subject of hardware at the time of writing the specification, the whole matter being relegated to the time when the hardware is actually needed, the architect then making such selection as he sees fit, within the allowances.

The amounts of the allowances depend, of course, entirely upon circumstances. Very fair hardware for inside-doors can be had as low as $1.75 per door. This allows for bronzed iron butts, 60 cents; wooden knobs, escutcheons and roses, 65 cents, and a one-lever lock, 50 cents. This means, however, a cheaper grade of goods than would often be advisable. An allowance of $5 per door will permit of solid bronze hardware throughout, including bronze butts, $2.50; a good, three-lever, machine-made lock at $1; bronze knobs, $1, and bronze escutcheon and rose, 50 cents. For office-work an allowance of $6 per door will provide a "Yale" lock with corrugated key, a spring latch, and bronze butts and knobs. For front-doors the allowances must be considerably increased. The lock ought to be of a grade costing not less than $4; the bolts, $2.25; the knobs, $2, and the butts, $6, or a total allowance of $14.25. For closet-doors, bronze butts and knobs and a small lock would average $3.50 per door, only one knob being necessary. $4 each is sufficient for sliding-door hardware, exclusive of the hangers, with latch only, or $5 with latch and lock. For fly-doors add $9 per door to the hardware allowance if the butts are of bronze, or $4.50 if of bronzed-iron. This is for house-work. For office fly-doors $12 should be added for bronze butts, and if push-and-pull plates are required an additional sum of $2 will be required.

For French windows $4 will buy two pair of bronze butts, and $2.25 answers for the bolts and the lock, making the total allowance $6.25 per pair. Door-transoms should have an allowance of $4 each, for nice work, which would purchase pivots or 3½ inch butts, $1.75; chains and catch, 75 cents, and lift, $1.50. Transoms are often hung with painted butts which are less conspicuous than bronze, and the total allowance can be scaled down as low as $1 for very simple work.

Sashes are trimmed for 50 to 75 cents each, though the allowance price is usually per dozen fixtures, say $4.50 for fasts and $2.50 for pulls.

A specification which would, therefore, provide for bronze hardware throughout an ordinary dwelling, of a good, average quality, might read somewhat as follows.

HARDWARE. — Allow in the contract the following sums to be expended as the architect directs upon hardware:

Front-doors,	$15.00 each pair.
Back-doors,	6.00 each.
Inside-doors,	5.00 each leaf.
French-windows,	5.00 each leaf.
Sliding-doors,	4.00 each leaf.
Closet-doors,	3.50 each.
Transoms,	2.50 each.
Sash-fasts,	4.50 per dozen.
Sash-pulls,	2.50 per dozen.

These prices are the net cost to the builder, and the owner is to have the benefit of any reduction therefrom. Beyond these allowances list and set all the hardware in proper manner; also provide and set such other hardware (in pantries, closets, etc.) as are called for or implied by the plans or specifications.

Sliding-doors to be hung by (Richards, Prindle, etc.) hangers running on (wooden, iron) tracks, properly adjusted, with proper centre stop.

The hardware for blinds, cellar bulk-heads, etc., is best specified in connection with the individual items, and should be described exactly, as the prices of the different makes vary greatly.

The allowance method is a very simple one for the architect, and when carried out according to the true intent and meaning of the specification, answers very well for ordinary house-work, especially as each contractor usually purchases his hardware of one firm, and the architect can then simply select from a single assortment of goods. The difficulty of such a system, however, is that the goods seldom cost as much as the allowances, and the difference goes to the contractor instead of to the owner, where it belongs. No architect has yet fully mastered all the intricacies of a hardware manufacturer's price-list, and as the price of each article is based upon so flexible a sliding-scale that even the builders are sometimes charged unevenly, there might be a dozen grades of knobs or locks, all at the same nominal price, though varying greatly in quality and in the real amount for which the dealer sells them.

Also, the system of allowances as ordinally followed gives too much liberty to the contractor, who usually submits to the architect one or two styles of knobs and locks which he will furnish for the allowances, so that the hardware often expresses the builder's rather than the architect's ideas of door-trimmings. There may be a hundred things in the market far better and at less cost than those offered, and while such a specification as the one quoted gives the architect the right to choose his hardware anywhere, in practice he is generally quite willing to shove an irksome job onto the shoulders of the contractor. In fact, the system of allowances is good only at its best.

In New York it is customary to be much more exact in the hardware specifications. No prices are given, the various articles being designated by sizes and by reference to some particular class of goods which is to serve as a standard. Thus: —

For inside-doors provide and set solid bronze 4½ inch loose-pin butts, two to each fold. Outside-doors to have three 6 inch loose-pin bronze butts.

Likewise for locks: —

Closet-doors to have 3½ inch locks; main inside-doors, 4 inch upstairs, 4½ inch downstairs; front-doors, 5 inch. Closet-door locks to have one lever, other doors all three levers; front-door in addition a night-latch and antifriction strike. The works of all locks to be of (brass, steel), with steel keys and (brass, phosphor-bronze) springs. Door-knobs in service portions to be plain, white porcelain, with black enamelled-iron roses and escutcheons; elsewhere to be plain, solid (or spun) bronze, with bronze roses and escutcheons, etc.

It is usual to describe knobs and miscellaneous fittings by referring to a catalogue or to samples in the architect's office, adding "or of a similar quality satisfactory to the architect."

It will easily be understood that in order to write a proper specification for hardware on such a basis as this, the architect must not only know and keep in mind all the numerous fittings necessary for a house, but must also be thoroughly posted on the possibilities of the market. As a matter of fact it is generally easier to call in a hardware man and ask him to write the specification, and the way in which such a method of specifying will fail will be in not being sufficiently general to cover everything, so that the contractor will have an excellent opportunity to bring in a big bill of extras at his own prices. Besides, a specification by sizes referred to a catalogue, "or something equally good," is by no means absolute. The difference between really good and absolutely bad hardware is often so effectually concealed by a superficial finish that, although the architect may refer to the best in the market and mean to have it, an unscrupulous contractor might run in inferior goods which only the closest, technical inspection would detect, though the difference would be speedily manifested in the wear of a few months. Even restricting the choice to the goods of a single firm is not always sufficient to prevent imposition, as there are, unfortunately, some manufacturers who make goods to suit the consciences of all sorts of customers, and have no fixed standards of either quality or price. In time the architect will discover these points by sad experience, and will grow very cautious; but the younger men, the householder and those who are either too indolent or too busy to properly attend to such details, will be more imposed upon by the New York than by the Boston method of specifying the hardware.

The third method is the only one which is really absolute, or by which the architect is sure of what he obtains. It has been adopted very largely by the Government in obtaining

[1] Continued from No. 714, page 95.

bids for public work, and, though quite clumsy at first, is the surest and easiest way in the end, relieving the architect from a great deal of bother and entirely obviating any discussion as to either prices or qualities. There is no reason why the same system should not be followed in connection with every building of sufficient size to warrant it. The specification calls for locks, butts, etc., of certain sizes, descriptions and weights, and requires that a full line of samples shall be submitted, with prices of each. These samples are then examined carefully, a selection made therefrom or others substituted if none are exactly suitable, and the contract is based directly upon the samples. It remains, then, only for the superintendent to insist upon having the identical fixtures referred to, allowing no leeway for anything "equally good," or "of similar quality."

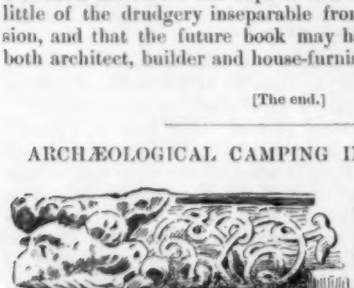
For small dwellings the method of allowances is very convenient, giving the architect full liberty to change his ideas to suit the work or to introduce any article which seems advisable, without being obliged to determine every detail in advance. But for all heavy buildings the Government method is better and fairer for both architect and contractor. The former can decide just as well first as last what he wants, and the hardware being all selected several months in advance, the contractor has ample time in which to make the best terms for the wares, and any delay in purchasing is then due solely to himself, while the question of price is definitely settled before any contract is signed. It is then the contractor's business alone how much he pays or how much discount he obtains, or what commission he receives for placing his order with the retailer, and so long as he matches the samples agreed upon, no one has any just cause for complaint.

In concluding this series of papers upon the subject of Builders' Hardware, the writer desires to acknowledge many sins of omission and commission which have been almost unavoidable, considering the complexity of the subject, the difficulty of ascertaining the condition and scope of the market, and the uncertainty of definite deductions. It has been written with special regard to the possibilities of the Boston market, but, at the same time, the goods of nearly all the manufacturers in the country have been studied and compared, so that it is believed the series will have more than a local significance. A number of excellent fittings have been discovered too late for insertion here, but it is intended to incorporate such, so far as possible, in the republication of these articles in book-form. The most the writer can hope is that he may help to relieve a little of the drudgery inseparable from the architect's profession, and that the future book may have a reference value to both architect, builder and house-furnisher.

C. H. Blackall.

[The end.]

ARCHÆOLOGICAL CAMPING IN ARIZONA.[1]—VI.



At this camping-place we had a scarcity of good fuel for our fire, for the Pimas had cut about all the mesquite off their reservation, and our thicket turned out to be chiefly palo verde (green wood), so called on account of the vivid green of its smooth bark. The Spanish name for the large shrub commonly called greasewood, which is one of the most abundant growths in this region, is the "*hediondillo*," a word more euphonious than pleasantly suggestive, for it means "little stinker." The application of this name to the greasewood must be taken as evidence that the Spaniards must have encountered it before they did the palo verde, or at least before they had ever tried the experiment of making a fire out of the latter, for in burning, the palo verde, especially when dry, gives off a stench of unspeakable vileness. Therefore they would naturally have called it the "*hediondo*," with never a thought of designating the harmless greasewood with its diminutive. The latter, though pungent, is not particularly disagreeable, for its odor is cleanly and somewhat resembles the extract of witch-hazel. Some palo verde, which was inadvertently put on our fire, had the effect of driving us beyond smelling range until it could be removed. The fire was then kept up with sage-brush, which, burning very quickly, was gathered in large quantities and constantly added. It makes a wonderfully brilliant flame, burning with intense brightness and no perceptible smoke. By the way, it would be well for everyone who has occasion to go to the far West to remember the remarkable qualities of the sage-brush as a febrifuge. A tea made of its leaves has cured some of the most violent cases of what is known as "mountain fever," and it might prove a blessing were it extensively introduced in medical practice.

We were favored with a week of moonlight, and that night, when the moon was near the zenith, Mr. Cushing and I went out towards the ruins with shovels on our shoulders, for, said he, the moonlight, with the black shadows which it casts, brings out on the ground in sharp distinctness from the white light the traces of the lines of house-walls so far obliterated by time as to be indistinguishable in the broad light of day. It proved to be the case, and the dark lines could be seen extending out over the ground in the mild light. Selecting a favorable spot, we soon encountered pottery remains, after which satisfactory result we returned to camp, knowing where best to look the next morning.

Early in the evening we heard a great howling in the distance, coming across the fields from the direction of the river. The next day we learned that one of the leading Pima chiefs, in consequence of a too liberal indulgence in "tiswin"—a beverage made from the fermentation of corn—had fallen upon a stick and impaled himself, and the howling we heard was the lamentation of the women of his village over his death. The proceedings were probably very similar to those of the Irish wake, which is a survival from a condition as primitive, probably, as that of these Pimas. Finally the wails died away, only to be succeeded by a more staccato and vivacious performance on the part of coyotes, whose yelping seemed like a commingling of an animated ward-caucus, a field-day on the New York stock-exchange, and a hotly contested dog-fight.

Some time was spent the next morning in excavating the ruins of Las Cenizas, where burned roofs and the abundance of cinders found in the excavations indicated that the place had, like Los Muertos, been overwhelmed by an earthquake. We found some interesting remains of pottery, etc., but the time at our disposal was too short to allow more than a reconnoisance, and shortly after nine o'clock we were under way. We passed another trading-post at Agua Dulce, or Sweetwater, and at noon we reached the main agency of the reservation, where we were courteously received by Major Howard, who at that time was agent for the Pimas. The reservation buildings were very substantial and extensive, making an impressive appearance, almost like a fortified post, when seen from a distance, as they loomed up across the plain. There is a missionary at the agency, and the net result of something like ten or eleven years' labor is one convert among the Pimas! We passed several Pima villages, composed of a few clustered huts, and as primitive in their surroundings as the burrows of so many prairie-dogs. Towards the end of the reservation we came to a small Pima cemetery, surrounded with stakes, the enclosure in the form of a square, with an entrance in the centre of each side, representing the gates of the four regions: north, south, east and west. The graves were covered with sharp, thorny branches to keep away the coyotes. Shortly after that we came to Walker's ranch, a fertile farm irrigated from the river, and with a fine orchard. Casa Grande lay about a mile to the southward, and, after passing the remains of a great irrigating-canal which showed how extensive must have been the population which it supplied, we came in sight of the most celebrated ruin in the Southwest. It is a striking-looking structure, and as picturesque in its way as the ruins of a mediæval castle. It grows upon one with acquaintance. I have seen no photographs that give a just idea of its character, except some large ones which express admirably the massiveness of the building, making it look very much like a natural formation; so much so that many people, on seeing these pictures, have asked if it were a view of some great rock carved by the elements.

The best view of Casa Grande, from an artistic standpoint, is that from the place where we pitched our camp, in a clump of mesquites in the hollow of an ancient reservoir, a short distance to the eastward. Standing here, the building is framed-in by the low-arching boughs of the trees, it rises from a terrace-like base formed by the crumbling away of the low buildings and thick walls that surrounded its exterior court, and the extent of the ruins flanking the main structure to the right and left, evidently once connected with it, but now detached by the crumbling away of intervening sections, is best seen from this point.

We had supper soon after pitching our camp, and had been counting on an appetizing addition to our regular fare. We had seen the wild Nopal or Prickly Pear growing here and there in the desert, and on my telling the Doctor what a delicacy it was in Mexico, with the disc-like leaves fried like the egg-plant, it was agreed to gather some and try them for supper. The leaves, bristling with prickles, are skittish things to handle, but by cautious proceeding we managed to detach a goodly quantity with a large hunting-knife, and, having nothing else to carry them in, we poked them gingerly into a clean bathing-towel which the Doctor had in his bag. At camp we found the towel utterly ruined, being stuck through and through with fine prickles: it would have made an excellent garment for a martyr, but as none of us was prepared to assume that rôle, there was nothing left but to thrust it into the fire. Then the question was, how to remove the prickles from the Nopal leaves, for in spite of the condition of the towel, their number did not seem in the least diminished. It was concluded to throw them into the fire also, and scorch off the

[1] Continued from No. 714, page 102.

prickles, just as they do to prepare them to be eaten by sheep in Mexico. This treatment was effected, and we easily peeled off the blistered skin. Then rubbing them with corn-meal they were placed in the frying-pan. A delightful odor arose, and as they were set before us, hot and beautifully brown, our mouths watered in anticipation. But alas! they were tough, stringy, and horribly bitter, and then it was I remembered that it was only the tender young leaves that the Mexicans ate, while these had been gathered in winter, after a season's maturity.

That night, in the full moonlight, the Casa Grande assumed a soft, poetic beauty, with its ruddy surface flooded with radiance that threw the shadows of its deep recesses into a rich mysterious obscurity — a transformation from the aspect of the ruins in the broad glare of daylight. While we lay in our tent, gazing dreamily at the beautiful picture, Mr. Cushing told us in his charming and inimitable manner one of the Zuñi folk-tales about the "Priests of the House" — a tale whose full significance was not clear to him until he came to this region and found the ruins of the "Great Houses." As we listened, the ancient walls before us seemed to be repeopled with the venerable old priests, and it would have required little imagination to have heard the weird, fascinating chants of the worshippers. Late in the evening I strolled through and around the ruins with Mr. Cushing. The walls are remarkably massive, and must have made an impregnable citadel of the structure for its builders. At the base the exterior walls are almost seven feet thick; their inner side is perpendicular, and outside they slope gradually inward, making their width at the top where they have remained in good condition and not been eroded away, something like two feet less. The building has probably suffered more within the past ten or twelve years from the vandalism of tourists and other predatory visitors, than within the previous three centuries since the coming of the Spaniards into the land. The few remaining timbers of pine and mesquite have been carried away by relic-hunters, and the walls so weakened that they have partially fallen, and other portions have become so undermined that they soon will fall unless measures are taken for their preservation. Fortunately this is now likely to be done. It providentially happens that the building stands on what is known as a "school section," that is, one of the square-mile sections of land reserved in every township by the land-law of the National government, for the benefit of the school-fund of the Territory or State in which it is situated, There are two of these sections in every township: Nos. 16 and 32. Casa Grande stands upon Section 16 in Township 5 South, Range 8 East, a little over two miles south of the Gila river. These sections cannot be sold until a Territory becomes a State, so that, although the neighboring country for miles around is coming under cultivation, and eagerly preëmpted on account of its wonderful fertility, this section cannot be taken up, and the rough nature of the surface, on account of the many ruins, has prevented its being squatted upon.

Fortunately the preservation of this ruin, so precious on account of its being the only standing example of this important class of structure peculiar to the ancient town-dwellers of the Southwest, and its consequent inestimable value for archæological study, is now assured. Mrs. Hemenway, who is the institutor of the expedition, perceiving the importance of this step, last winter set about making earnest efforts to secure from Congress measures for its preservation; and ably seconded by Mr. Cushing, who spent several weeks in Washington for that purpose, though suffering from serious illness at the time, legislation was obtained setting aside, as national property, the land on which the ruins are situated, including not only the section itself but enough of the surrounding land to take in the remains of the old city in the midst of which Casa Grande stands. An appropriation of $2000 was also made for the protection and care of the building, and it is hoped that another Congress will continue the good work by providing for repairs that will ensure its complete preservation.

The walls are of adobe bricks, but are built in the same style as that of the temple at Los Muertos, which I described in a previous article — concrete laid between coarse wicker-work woven through rows of stakes, which are afterwards enclosed in the walls by thick plastering outside and in. The only floors in the building are formed by the fallen débris which covers the ground unevenly in the interior. There is a tower-like section in the centre, four stories high above the ground, and surrounded by a portion now three stories high. There are evidences that the walls have crumbled away for a story, and as there are probably two additional stories now below the ground, on account of the accumulated débris, it is likely that the building was seven stories high in the centre, and six in the main walls. Mr. Cushing's investigations show that there is a natural law regulating the gradual decay of buildings, just as of the wearing-away of the earth's surface.

The soil hereabouts contains a sort of natural cement, so that when used for building-purposes, by mixing with water, it becomes very hard. The walls of Casa Grande are almost like stone. The interior is still covered with a smooth polish that almost seems like a glaze. It was probably done in the same way that the Indians polished their pottery so finely, by rubbing the surface with a smooth stone. The exterior still shows traces of the coloring of its walls that gave it the name of "the Red House." As a primitive people rarely, if ever, does anything willfully, but attaches some significance to the way in which the most trifling things are done, it seems as if this coloring must have had some religious meaning. Possibly they may have given their Great Houses the sacred color belonging to the region to which the location of its city in the group of cities would assign it. Under this hypothesis Casa Grande would have belonged to the city of the South, if the colors of its people were the same as those of the Zuñis of today; while if Casa Blanca really gained its name from the color of its walls, it would be the Great House of a city of the North, in another group. It is possible, however, that with its ancient people the order of the colors were quite different from that of the Zuñis, for the ideas governing such things appear to change with environment, and among cognate Indian peoples today the order of the colors assigned to the seven regions varies considerably.

It is probable that the lower rooms of these great buildings were used for storage purposes, particularly as granaries. A most important archæological feature was pointed out to me by Mr. Cushing. Readers of the *American Architect* may remember an article published in this journal several years ago, describing an important observation by Mr. Cushing, concerning the development of the door among the Zuñis. The etymology of their word for door showed that its meaning was, literally, "a wooden stone close," indicating that before the introduction of wood-working instruments of metal by the Spaniards they were unable to make doors of wood with their stone implements, but closed the openings with slabs of stone. These ancient "stone closes" were subsequently found by Mr. Cushing when investigating some old ruins. Closing up a doorway between two of these rooms in Casa Grande was a huge block of adobe, fitting the opening accurately and with smooth surfaces and true edges. This "stone close of earth," as it might be called, was probably made by moulding it in a great basket made for the purpose. It would seem to have been extremely difficult to move such a ponderous mass in opening and closing the passage, but they probably had some simple and effective means of accomplishing it. In this alluvial region, of course, earth was the most available material to make doors of, for the transportation of stone slabs from the mountains would have been too great a task.

Father Kino, who visited this place in 1694, as a Jesuit missionary, relates that the Pima Indians, who lived in the neighborhood, told him that the Casa Grande was already in ruins "five old men's lives before," which would be 500 years; and they told him that it was once seven stories high, which would accord with Mr. Cushing's deductions from personal observation.

Father Mange, who accompanied Father Kino in 1697, on his second visit, wrote: "The principal room in the centre is four stories high, and those adjoining it on its four sides, three stories, with walls three varas [a vara is about two feet] of strong *arganasa y barro* [mortar and clay — the natural cement in the soil gives the appearance of the use of mortar], so smooth on the inside that they resemble planed boards, and so polished that they shine like Pueblo pottery. The corners of the windows, made square, are very straight and made without supports or cross-pieces of wood. They look as if made with a mould. The doors are the same, though narrow. By this it is known to be the work of the Indians. The exterior is 36 paces long by 21 wide. It is well built. At the distance of an arquebuse-shot are seen 12 other buildings, half in ruins, also with thick walls, and all the roofs burned out except one low room, which has round beams apparently of cedar, small and smooth, and over them reeds of equal size. On these was laid a layer of hard mud and mortar, forming a very curious roof or floor. In the vicinity are seen many other ruins and heaps of rubbish covering the ground for two leagues, with much broken pottery, plates, and jars of fine clay painted in various colors. It resembled the Guadalajara ware." He also described "a canal which runs from the river over the plain, encircling the settlement, which is in the centre, and is three leagues [a Spanish league is about 2½ miles] in circumference," and he described the canal as ten *varas* wide and four deep, carrying perhaps half the river. It thus served as a defensive ditch, as well as to supply water for the houses and to irrigate surrounding fields. Father Font, another Jesuit, gives the following account, with more accurate details: "The site on which this house is built is flat on all sides, and about one league from the Gila. The ruins of the houses extend for more than a league to the cardinal points. . . . Round about there are ruins indicating a fence or wall which surrounded the house and other buildings, particularly in the corners, where it appears there had been some other edifice like a castle or watch-tower, for in the angle which faces towards the southwest there stands a ruin with its divisions and an upper story. The exterior plaza extends north and south 420 feet, east and west, 250. The interior of the house consists of five halls, the three middle ones being of one size, and the two extreme ones longer. The three are 26 by 10 feet, and the others 38 by 12. All are 11 feet high. The outer doors were four by ten, the inner ones half that. The outer walls were six, and the inner four feet. The house is 70 by 50 feet, the walls sloping slightly on the outside. . . . Before its eastern door, separate from the house, there is another building, 26 by 18 feet, not counting the thickness of the walls."

Capt. Richard Hinton had an interesting article on the Casa Grande and other notable ruins of the Southwest, in *Harper's Weekly* for May 18, 1889. It is to be regretted that he called his paper by the romantic but inappropriate title of "The Great House of Montezuma." The Montezuma myth of the Southwest has been shown to have been pure fiction, — a legend put into the mouths of the natives by the early Spanish missionaries through a misapprehension. The name was never heard there until the Spaniards

brought it from Mexico, and the Aztec monarch had no more to do with the natives there, than with the Algonquins. Capt. Hinton alludes to the account by Capt. A. R. Johnson of the Kearney New Mexico and California expedition in 1848, who gave a clear description of what he observed here, including among his description of the surroundings a circular embankment 600 feet to the northwest of Casa Grande, which Kino and Bartlett held to have been the enclosure of a corral, while he regarded it as the wall of a great well or reservoir. Captain Hinton could find no trace of this at the time of his own visit; only an irregularly-shaped mound of the usual grayish earth-material. Nevertheless it is still there, and is the remains of one of the "sun temples" heretofore described; only it is not circular, but boat shaped, and its plan is fairly well given in the illustrations from Johnson's sketches in *Harper's Weekly*, as the "Ground-plan of Ancient Structure or Enclosure." Captain Hinton also says that Johnson's special find cannot now be found. "None of the missionary explorers mention it, either. That was a terrace but a few yards to the north of the supposed well or corral. According to the Captain it measured 300 by 200 feet, and was five feet high. On it in the centre was a pyramid eight feet in height, and with a summit platform of 75 feet square. Captain Johnson, who was killed soon after at San Pasqual, California, bore a high reputation, but no else has ever seen, outside of Central America or Central Mexico, any remains of that character." Captain Johnson was, after all, correct in his observation, but not in his deductions. Owing to the irregularity of the surface caused by the various ruins of the neighborhood, this so-called terrace would escape the attention of a casual observer; but, on the very spot that he mentions, there is a huge mound formed by the gradual decay of a great building, whose successive stories in their fall have given the appearance of terraces.

Our party made some important investigations in the neighborhood of Casa Grande, but the site is a peculiarly difficult one for excavations, and the ground needs to be taken hold of systematically to secure satisfactory results. Much harm has been done by the operations of random amateur explorers and relic-hunters, who have scratched and burrowed a little here and there; and it is fortunate that this will be put a stop to by the recent action of Congress looking towards the protection of the ruins.

A few miles to the eastward of Casa Grande we camped at another ancient city, where a portion of the walls of one building was still standing. There were the usual features of the central temple, or citadel, in a mound of ruins, and a large Sun Temple. Our experimental excavations yielded some excellent results, in the shape of a number of jars containing cremated remains from a pyral-mound, together with several valuable smaller articles.

At Florence, the seat of Pinal County and the trade centre for the middle Gila valley, we renewed our supplies and proceeded farther southward. Florence is about ten miles easterly from Casa Grande, and is a comparatively new place. Its superior site was the cause of the entire abandonment of the neighboring town of Adamsville, a few miles down the river on the road to Casa Grande. The latter place, on passing through, presents a singular spectacle for a growing new country, with its silent city-like street with tenantless ranks of substantial adobe buildings.

The situation of Florence is pleasingly picturesque. The Gila River breaks out of the mountains a few miles above, between two grand buttes of rich, ruddy hues and architectural aspect; fascinating at all hours of the day in the changing shadows that heighten the brilliant sunlight flooding their perpendicular sides. To the northward and eastward the lofty Superstition and Pinal Mountains rise in unbroken ranks; in other directions the mountains stand in isolated groups. The Gila Valley is very rich, and its fine state of cultivation near the town makes it most attractive to the eye. The mesquite trees standing here and there in the irrigated fields are notable by reason of the contrast of their graceful proportions, reaching to a height of 40 and 50 feet in consequence of plentiful watering, to the scrubby and scrawny growth of the same tree in the desert.

There is a great irrigating-canal built on a scale rivalling the ancient works of this country, to supply the extensive plains on the south side of the river; its capacity is sufficient for 140,000 acres. The upland plains southerly from Florence are frostless, owing to the direction of the air-currents determined by the surface conformation and the position of the neighboring mountains. In this dry interior region there usually falls a sudden chill immediately with the setting of the sun; but so great was the warmth of these air-currents that one evening, when the Doctor and I had not been able to find the rendezvous appointed with the rest of the party, who had come on more slowly behind, we drove about for two or three hours in the glorious calm moonlight in our search, and I felt no occasion for adding to the light summer clothing I was wearing that January day. In our camps, too, the nights were wonderfully mild, and we felt no need of shelter whatever. That day, as we drove southward from Florence, the plains presented a sight of most refreshing beauty. There is always more rain near the mountains than farther out in the valley, and as we approached the Picacho group we suddenly found ourselves entered upon a belt of lovely verdure: for miles on either side the plain stretched away in a floor-like evenness, tenderly green with a mantle of young grass, while the mesquite-trees, standing sparsely here and there, were covered with their soft, feathery foliage, untouched by the frost. When these uplands are brought under irrigation they will make the finest kind of lands for oranges and other semi-tropical fruits.

Crossing through a pass of the Picachos that afternoon we beheld a rare spectacle; upon the verge of a crag towering several hundred feet above us there stood, sharply outlined against the sky, the noble form of a mountain sheep. He stood perfectly motionless for several minutes, surveying the country like a monarch of the mountains, with head held proudly and great horns curving backwards. We stopped, the Doctor hastily seized his rifle and crept stealthily up towards the cliff. He fired, and as the sharp report rang out on the still air the beautiful animal turned, and in one superb bound disappeared from sight. I was not sorry that the distance was too great for even such a skilled marksman as my companion.

The valley on the other side was that of the Tortolitas, and there we found the remains of other ancient towns, notable for being beyond the line of river irrigation, and therefore dependent on the storage of water from the torrents pouring down from the mountain-sides.

From this point we returned to Camp Hemenway by way of Florence, taking nearly two days for the trip, and arriving with a color on our cheeks that in depth of brown rivalled that of our Mexican companions.

SYLVESTER BAXTER.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE FOR A. W. NICKERSON, ESQ., DEDHAM, MASS. MESSRS. SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS, BOSTON, MASS.

[Gelatine Print, issued only with the Imperial Edition.]

SECOND PRIZE DESIGN FOR THE IOWA SOLDIERS' MONUMENT. MR. ROBERT KRAUS, SCULPTOR, BOSTON, MASS.

THE monument was intended to be of Quincy or Concord granite, sixty feet from the ground to the crown of the head of the upper statue, twenty-two feet in diameter at the lower base or with the steps about thirty-six feet, and fitly proportional as it rises. The figures in front represent Liberty and Union as the objects for which the soldiers fought. Around the die are arranged the figures of soldiers, not standing as inanimate statues, but as symbols of the perils and glories of the battle-field — the fearless charge, the alert courage, the heroic valor, which distinguished the Union armies, the intrepid advance where comrades had fallen before them, the dauntless officer seizing the flag when the color-bearer fell dead in his arms. The figures in this extended group represent infantry, cavalry and artillery; the monument, surmounted with a figure with a flag in one hand and a palm branch in the other, the emblem being "Victory to our flag." The bands around the shaft to contain the names of the battle-fields where Iowa soldiers were engaged, as Jackson, Corinth, Shiloh, Fort Donelson, Atlanta, Vicksburg, Pea Ridge, etc. The spaces between the palm branches on the lower base to be inscribed with the names of the regiments, divisions and batteries, their loss in officers and men. All figures to be of standard bronze, *i. e.*, twenty per cent copper, five per cent spelter, and five per cent tin. The cost of the monument completed and set up would be $100,000.

HOUSE FOR MR. MILBANK, GREENWICH, CONN. MESSRS. LAMB & RICH, ARCHITECTS, NEW YORK, N. Y.

THE house is on a bluff, with a far view of the Sound. The side shown is the entrance porch side towards the town. The house is built of light brown stone, first story, with graduated shingle work above and ornaments in solid carved wood. The interior is blessed with huge fireplaces of the old-fashioned type, 6′.0 in the opening, and the finish is oak and white. The house is being built under the direction of James P. Niblo, builder.

DESIGN FOR A HALF-TIMBER HOUSE BY MESSRS. W. H. ORCHARD AND E. S. GORDON.

THESE designs were placed first and second in a recent competition of the Rochester Architectural Sketch Club.

CHURCH, ALEXANDRIA, VA.

SPECIMENS OF WROUGHT-IRON WORK, SKETCHED BY MR. WILLIS POLK, SAN FRANCISCO, CAL.

OFFICE-BUILDING FOR THE LANING ESTATE, WILKES-BARRE, PA. MR. M. B. HOUPT, ARCHITECT, WILKES-BARRE, PA.

OLD COLONIAL WORK OF VIRGINIA AND MARYLAND.[1] — IV.

SIR FRANCIS WYAT, a young Irish gentleman, coming out as Governor in 1621, was charged to see that the Church of England and the laws of England were respected in his province; to suppress gambling and drunkenness; to punish pirates; to teach the savage heathen; to regulate the dress of the colonists, permitting only councillors and heads of hundreds to bedeck them in gold lace, and forbidding any to appear in silken clothes until Virginia should grow the silk; to cultivate corn and the grape; to regulate the excessive growing of tobacco, not allowing indentured servants to forsake their trades to plant it; to build water-mills; to make pitch and tar; to explore the country for precious minerals; to take a census of the colony — and, much more, tending to promote the general welfare of the settlement.

With Wyat came George Sandys, Treasurer of Virginia, and brother of Sir Edwin Sandys of the London Company, who was, according to Pope and Dryden, one of the first versifiers of his time, an Oxford man, and a great traveller in Europe and the East.

Eighty Irish immigrants settled at Newport News, and three thousand five hundred settlers in all came out during 1621 and 1622.

The colony at this time exported yearly twenty thousand pounds of tobacco, almost the entire crop. Before the end of the century the annual shipment of tobacco to England amounted to fifteen millions of pounds, the revenues from which aggregated £100,000.

At noon on Friday, the 22d of March, 1622, the Indians, in several bands, fell upon the James River settlements, and in a few hours butchered three hundred and forty-nine men, women and children. The paralyzing effect of this terrible massacre, in which fell about one-twelfth of the whole population, was long felt in the colony. Among its immediate results was a strong reawakening of the dread and hatred of the Indians which the philanthropic efforts of such men as George Thorpe, Deputy of the College land, Sandys and others had nearly overcome. Thorpe himself was one of their first victims, being slain at Berkeley with ten other persons. Opechaueanough, the instigator of this awful treachery, had been living in a fine house built for him in the English fashion by Thorpe upon the College lands. "The chief was so charmed with it, especially with the lock and key, that he locked and unlocked the door a hundred times a day."

King James seized upon the pretext of the massacre, when news of these dire events had reached England, to institute an inquiry into the affairs of the Virginia Company, which finally resulted in the annulling of their charter, after a prolonged struggle, in 1624.

"The company thus dissolved had expended one hundred and fifty thousand pounds in establishing this Colony, and had transported nine thousand settlers without the aid of government. The number of stockholders was about one thousand, and the annual value of exports from Virginia was, at the period of the dissolution of the charter, only twenty thousand pounds."

Among its members were "fifty noblemen, several hundred knights, and many gentlemen, merchants and citizens." "Among the leaders in its courts were Lord Cavendish, afterwards Earl of Devonshire; Sir Edwin Sandys; Sir Edward Sackville, afterwards the celebrated Earl of Dorset; and, above all, the Earl of Southampton, the friend of Essex and the patron of Shakespeare."

In March, 1625, died King James the First, and his son, Charles the First, succeeded to the throne. The settlements on the James River had now reached the "Falls," where the advance-guard of pioneers had built them a few rough cabins within the fortified enclosure of the prescribed stockade. Near "Powhatan," a few miles down the river, fifteen thousand acres of land had been laid out for the benefit of the University of Henrico, and a few settlers were living there.

At Falling Creek were the ruins of the furnace and other buildings erected by Berkeley, who intended to engage in the smelting of lead and iron here, but burnt by the Indians in the late uprising. The mine from which he is said to have taken valuable ore has never been found. Farther down, upon a narrow neck of land encompassed within a horseshoe bend of the river, at "Dutch Gap," was the City of Henricus, fortified behind two strong palisades stretching across from river to river. The town stood well out on the peninsula and had three streets, a church and an Indian College. Along the river below were Fort Patience and Mount Malado, and still farther down the stream were Bermuda Hundred, Flowerdew Hundred, Wyanoke, West and Shirley Hundred, Berkeley, where Thorpe was killed, Westover and Martin's Brandon.

"This group of cabins on the banks of James River," says Cooke, "was the advance-guard of civilization, a sentinel posted on the look-out. It would not do for the little band of English to relax their vigilance. Human wolves were lurking around them, ready to spring upon them at any moment, and life was a hard struggle with disease and famine." The settlements were far apart, each was surrounded with a palisade, and in the year immediately succeeding the great massacre every one was on the alert, danger was ever present. Their houses were of a rude sort, generally built for comfort and defense, and with small regard to appearances. They were mostly of wood. "The stalwart planters go to and fro on horseback," but mainly get about by way of the river.

Some of the more important houses had, even at this early day, some pretensions to elegance and were of fairly good size. They were furnished with movables brought over from the mother-country.

"Here is the smiling lady of the manor in a huge ruff, with high-heeled shoes and a short skirt, coming to welcome us, and behind her is her spouse, the hearty planter himself. He is a commander and head of a hundred, so he wears 'gold on his clothes' as the law entitles him to do (1621), others are forbidden that. His official duties are responsible ones. They are to 'see that all such orders as heretofore have been, or hereafter shall be given by the Governor and Council, be duly executed and obeyed' in the hundred which he commands (1624). He is also a 'commissioner' or justice of the peace, to determine all controversies under the value of one hundred pounds of tobacco. Thus the worthy X— is military commander and civil magistrate, executive and judge of the little community; a royalist in sentiment, as everybody is, a Church of England man, and a hearty hater of things papistical and of dissent. . . .

"A little society huddled together in the peninsula between the James and York; dependencies reaching into the wilds; on the rivers gold-laced commanders rowed swiftly by indentured servants; on the outposts pioneers watching against attack; everywhere strong contrasts of white, red and black; the society composite, but harmonious; the Church of England the only religion, though dissenters will soon intrude; the test-oath against papacy demanded of every new-comer and official; the Assembly protesting against the claim of the Governor to tax them by proclamation; men in armor going to harry the Indian settlements in spring and autumn; public officials losing their ears; double engagements between men and maids punished with fine or whipping — this is the queer old society which we have looked at. The whole is English in warp and woof. These Virginians of the early times read English books, wear English clothes, eat from English plates with English knives and forks, and follow England in all things. Their church is the Church of England; the Governor is the representative of the King of England; his Council is the English House of Lords, and the Burgesses the English Parliament. . . .

"They were simply a society of Englishmen, of the age of Shakespeare, taken out of England and set down in Virginia."

There was a steady extension of the settlements and a regular growth of the wealth and condition of the planters going on without interruption through the remaining three-quarters of the century, and with these better fortunes of the colony came, of course, great improvement in the architecture of the young country. An inordinate passion for land-owning seems to have early possessed them, and enormous tracts of country were granted to the more distinguished settlers.

The population of Virginia in 1715 was about 95,000, of whom 23,000 were negroes. Of other servants there were many persons of humble degree who worked for hire upon the plantations, besides the "kids" — a possible derivation from kidnap — who were apprenticed for terms of five years, and finally a small percentage of convicted felons who had been forced upon the colony by the government from time to time, and who were farmed out to the planters at low rates.

At the seats of the aristocratic great planters were always large retinues of slaves and indentured servants, and life at these places had developed, at the beginning of the eighteenth century, into an affair of much luxury and lavish expenditure.

Very few of the handsomest of the colonial manor-houses antedate this time. The rage for building costly houses lasted up to the first years of the Revolution. But the stress of that long, hard struggle gave the people other matters to think of, and a decadence in the architecture of Virginia set in about that period.

[1] Continued from No. 712, page 73.

Thomas Jefferson, writing his "Notes" in 1781, has something to say about the rude huts of the poorer classes, built in pens and with the crevices between the logs roughly smeared up with plaster. He adds that board houses were erected nearly everywhere in preference to buildings of brick or stone, a false idea prevailing that the latter were damp and admitted rain through the walls.

He goes on to disprove this to his own satisfaction, and deplores the exclusive use of wood in building, which precludes all hope of improvement in the architecture of the country, both because of the necessarily temporary character and short life of these wooden houses and the inadaptability of the material to elegance and dignity of design.

The first three-quarters of the eighteenth century, then, were unquestionably the golden age of Virginia in the matter of architecture, and perhaps in other respects besides. The manorial country-seats of that day were always built upon the river shores, and each place had its long wharf extending out into the water deep enough for the light-draught English vessels which lay at their ends unloading London commodities, and taking on tobacco for England.

Carter Burwell's famous house stands upon an eminence about seventy-five feet higher than the river. Three broad terraces break the descent to the level fields lying along the river shore. The view from the house, across the meadows and over the glistening river widening out below into Burwell's Bay, is very fine.

Away upstream to the westward one is shown where Jamestown stood in the olden time. Enormously costly must have been the building of such a house as this one in a country so destitute of proper material and workmanship as was the Virginia of its day. It would be very interesting to know something about the making of the plan of the house, the arrangement and details of which have evidently received such careful study. It is singular that the names of the architects of these aristocratic mansions should be nowhere discoverable, and yet, of course, the titles of the owners and occupants are always so intimately associated with a house that others connected with its construction may very easily be forgotten. Doubtless, whatever plans there may have been were made in England, the colony hardly affording at that stage of her existence a very promising field for architectural immigrants. The English manor-house of the period was the invariable model. The division of space was extremely simple. The finishing of the interior, the arrangement of the handsome wainscotings, the mouldings of the architraves, chair-boards, bases, friezes and cornices, and the work upon the great rich stairways, all evince careful study and an educated taste.

Nearly everything was brought over from England, it would seem, and the cost of transportation alone must have been considerable.

It is to be presumed that there were enough competent workmen in Virginia to put things together when they arrived on this side. Nevertheless, it must all have cost a pretty figure, and no doubt these lordly planters paid in princely fashion for their magnificence.

Mann Page seems to have well-nigh ruined himself in the building of his great manor-house of Rosewell, and we find his son petitioning the Burgesses for authority to sell enormous tracts of the Page domain in order to pay the debts of his father, both in England and the colony, he having found it beyond his power to liquidate them from the proceeds of the estates.

These lands included eight thousand acres in the estate of Pageland in Frederick County, ten thousand acres in Prince William, four thousand five hundred in Spottsylvania, one thousand in King William, two thousand in Hanover, two thousand in James City, besides lands in Essex, Gloucester and elsewhere, not enumerated.

Bishop Meade, in his "*Old Churches and Families of Virginia*," says: "Now it cannot be doubted that the tradition is correct that much if not all of the original debt was contracted for the erection of this immense pile of building, every brick of which, and doubtless much other material, together with the workmen, were imported from England and not paid for, except by his agents and friends there, until the sale of these lands in Virginia enabled the son, long after, to do it. The whole of the roof of this ancient building was covered with heavy lead over the shingles. The result of this immense expenditure was not only the entailing a heavy debt upon his estate, and the causing a sale of lands which might have furnished his posterity for some generations with farms, but the keeping up such an establishment has been a burden on all who have possessed it to the present day, as must be the case with all such establishments.

"For a long time old Rosewell has been standing on Carter's Creek, in sight of York River, like an old deserted English castle, in solitary grandeur, scarce a tree or shrub around it to vary or beautify the scene. No one of the name of him who built it has owned it or could afford to own it for generations. Some stranger fills the Stuart's throne. *Sic transit gloria mundi.*" But the worthy bishop does not take into account the very great outlay necessary to working or even merely owning such a principality as the Pages governed.

"The Acts of Assembly give us other instances in old Virginia. Mr. Lewis Burwell, of King's Mill, near Williamsburg, built a house worthy of his first-born son, to live in; and that first-born son, after his father's death, was obliged to petition the legislature for leave to break the entail and sell a large tract of land in King William to pay for it."

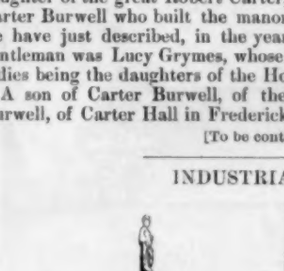
The laws of primogeniture and entail were even more rigidly enforced in Virginia than in the mother-country, and estates were handed down for generations in the line of the eldest son.

The Lewis Burwell of King's Mill, whom the old bishop cites in his disapproval of the luxurious and expensive elegance of the colonial houses, was the son of Major Lewis Burwell and Elizabeth, daughter of the great Robert Carter, of Corotoman, and a brother of Carter Burwell who built the manor-house of Carter's Grove, which we have just described, in the year 1737. The wife of the latter gentleman was Lucy Grymes, whose sister married Mann Page, both ladies being the daughters of the Honorable John Grymes.

A son of Carter Burwell, of the Grove, was Colonel Nathaniel Burwell, of Carter Hall in Frederick County. A. B. Bibb.

[To be continued.]

INDUSTRIAL ART.



Fountain at Mayence.

M. MELANI ALFREDO, Professor at the Superior School of Art, at Mantua, has just published through Ulrico Hoepli, of Milan, two interesting volumes on decoration and the artistic industries. The historical side of this work is extremely attractive, for the author, with concise learning, recapitulates the story of the rôle played by decorative art in Egypt, Assyria and Phœnicia in the first place; then in succession in Greece, Etruria, Rome, Pompeii; in Arab and Byzantine society, and in the Romanesque world; then, finally, in Lombardy in the first place, and next in all Italy during the Renaissance, as well as in France before and after the Decadence. The reading of these two volumes is not only useful, but indispensable for all who wish to understand thoroughly this branch of art, of which they contain the substance. In the main, industrial art is fatally summoned to enlarge its dominion, to issue from its narrow limits in which it has been confined up to the present time, and to become, in a word, a real art, in place of being a kind of counterfeit art, as it has been considered until to-day.

It is certain that if the State has not the power to awaken at its desire an artistic impulse in the people and beget *chefs-d'œuvre*, the political organization of a country is called on to exercise a direct influence on the direction which the intellectual activity of the people takes in things which afford pleasure to the beholder. When municipal life absorbs all the popular faculties, as in Italy before the Renaissance, the individual thinks only for the people as a whole. The citizen dreams only of what he can contribute to the glory or the lustre of a city, and he sacrifices, if he must, his personal well-being to that civic pride which for him is a duty. At that time art busied itself in building and ornamenting public monuments; at that time were seen rising everywhere, cathedrals, public palaces, establishments of common usefulness, which were embellished without haggling, because they were considered the common property of all. To-day the function of the State, the rule of the municipality, have been radically modified. The citizen pays to the power an agreed ransom for the assurance of his own security, after which he thinks only of his own well-being. The development of individualism has materialized the functions of the public powers who have not, with the masses, other points of solidarity than those which unite the salaried *gendarmes* to those whom he protects. When one has given to a *gendarme* a good sabre and fine carabine, he needs no more of him, but is free to think only of his home. Every one loves to have fair places and fine promenades; but, above all, one loves to have in his own home the greatest possible amount of comfort. In place of concentrating effort on some public monument, artistic luxury tends to scatter itself about the hearth or in works of household usefulness. The era of decorative art has dawned, consequently the work of M. Melani, as well as of all those who treat this subject, come quite apropos.

For my part, I find that this industrialization of art towards which we are tending must be faced with some mistrust. I do not in any way share the delusion of those who believe that there will result from it a new age of gold. Art is, in its essence, aristocratic, and in popularizing itself, in becoming democratic, in being applied to ordinary and vulgar objects, it will lose in intensity that which it will gain in expansion. It is good, surely, that utensils and furniture should offer as elegant a physiognomy as possible, and should join agreeableness of aspect to their utilitarian use. We know now that with the ancients, the Greeks, the Etruscans, the Romans, to speak only of these, this step was partly realized. Pottery, glass, all minor objects of the toilet and of the *cuisine* were made with a taste

full of distinction. Glass, even, had reached a degree of perfection which we have not suspected, for we for a long time believed that the ancients were ignorant of the art of casting glass, or that they practised it only with clumsiness. I have seen, on the contrary, at certain museums at Orvieto and Corneto, phials of polychromatic glass and moulded pots which proved that even amongst the Etruscans they knew the secret of working glass as finely and with as much elegance as to-day at Murano. Industrial art was also applied to articles of commerce. Who has not been stricken with astonishment and admiration before the weights and bells and keys and hammers and richly-ornamented door-knockers that have been found at Pompeii?

But the new industrialization of art towards which we are progressing will affect, if we do not take care, a fatally trivial character, because times are no longer the same. There is reason for supposing that at Rome, and amongst the Etruscans, industrial decoration was destined exclusively for the upper classes, and that the common people used objects devoid of æsthetic pretensions. In the Etruscan necropoles are discovered, by the side of the tombs of great personages which contain amphoras, arms and utensils of incomparable richness — pits whence they extract vases roughly shaped, formless and ugly. To-day the diffusion of wealth has given birth pretty much everywhere to a taste or an ambition for luxury, and industrial art will be *bourgeois* or it will not. Now, whoever calls art *bourgeois* declares a negation of art. The essential condition of a truly industrial art is that it must submit to the law of competition — must run the chances of commercial struggle, and must finish, in consequence, by being cheap, which, in the domain of art, means that it must be common.

M. Melani, by implication, confesses this, without suspecting it, in the pages where he deplores and seeks the causes which have hindered up to now the development of artistic decoration. He recognizes that every object of industrial art ought, in order to bring about its vulgarization, to be a matter of current use and within the reach of every one's purse. Now these common things will never be the chased cups of Cellini nor the faience of the school of Della Robbia which unite these two conditions. But aside from these exceptions, the work of M. Melani is of the greatest interest, and ought to be consulted by all those who love to make themselves familiar with the subject which he discusses.

We have had lately at Rome several exhibitions, two of which were devoted to painting and sculpture, one to water-colors and one to ceramics, which last was certainly the most interesting of all.

The best service which can be rendered the contemporary artists of Italy is to ignore their work. I speak of those who exhibit; for the self-made men, those who have really talent, such as Michetti, Coreano, Ferrari, Monteverde, shun exhibitions where their works run the risk of being found mixed with sketches whose neighborhood is anything but flattering.

The juries of admission are inexplicably indulgent. According to their ideas it is enough to smear a canvas with colors, or to ferociously scratch against a morsel of marble to have succeeded in making a painting or a statue. It results from this that the Italian exhibitions offer us a disconsolate picture of the sad decadence into which the art of this country has fallen, which once knew such glorious days — a country which once showed the road to every other people, who, since the Renaissance, have excelled in their turn in the cultivation of the beau ideal. What are the causes by which artistic genius seems condemned to a doleful sterility under a radiant and fecund sky, which formerly lighted the fairest flowering of art which humanity has ever known? The problem is one of the most complex, and deserves to be investigated by the critic; but I do not allow myself to be tempted by the variety and breadth of the subject, since it would force me to greatly exceed my allotted space.

I prefer to say some words concerning the ceramic exhibition at the Palace of the Fine Arts, which drew together a crowd of artists and *dilettanti*.

The Italian collections are interesting and precious, not only because, after the barbarism which followed the fall of the Roman Empire, they are the works of Umbria, Marches and Sicily, which kept in honor the art of decorating faience, but also because it was Italy which saved from destruction the most remarkable remnants of Mooresque ceramic work brought from Spain before the expulsion of the Arabs. Thus it is that we can find here models of platters, vases and statuettes made in the potteries of Valencia, Manises and Majorca. It is doubtless through a corruption of this last word that in Italy the name of Majolica was given to elaborate pottery. It is beyond doubt the Spanish Arabs who introduced into Sicily the art of decorating pottery, and we know of vases with a glazing of metallic lustre, which issue from the workshops of Palermo, Trapani and Caltagirone, which perfectly resemble those preserved in the Alhambra. Besides, before the introduction of the Moorish style, there had been tried spontaneously in Italy several methods of refining pottery and dishes. In the museum at Frioli and Cividale there is preserved a varnished platter with Lombard inscriptions. To-day it is no longer disputed that the faience plaques which sparkle upon certain Italian monuments of the tenth and eleventh centuries, for example, were made on the peninsula, in place of being Spanish faience, added by the architects to the monuments of that epoch to enhance their beauty by polychromatic adornment.

Finally, in the first half of the fifteenth century, Lucca della Robbia brought ceramics to the level of an art of the first order, and raised it to such a degree of distinction that the productions could be placed side by side with the sculptures of Donatello in the decoration of the grandest religious monument at Florence. After the vigorous impulse given to this art by Della Robbia, the works of Umbria, of Marches, of Romagna, and especially those of Gubbio and Faenza, reached the apogee of their fame, and the specimens which remain to us prove that designers of exceptional value and distinguished specialists lavished all the resources of their talent to nourish and increase the fame of the product.

To-day Italy only possesses workmen who cling to imitating the ancients; and the models of modern industry which have figured at this exhibition bear testimony to an absolute decadence, if we except some Venetian curiosities, or the porcelain collection of Ginori, which, nevertheless, are far from being possible of comparison, even superficially, with Sèvres or Saxon ware.

One could also see in certain sections of this exhibition a very varied collection of Etruscan, Roman and Greek specimens. There were even three statuettes, which were called "Tanagra Statuettes," which were found in the tombs of Bœotia, which, in spite of the reputation for foolishness which the Athenian poets made for it, gave birth to Plutarch, Pindar and Corinna. One of the statuettes, belonging to Prince Odeschalchi, is a marvel of grace. It is a seated Venus, which, in itself, attests the extreme ability of the Bœotian artists.

In short, in passing through the halls of the Palace of the Fine Arts, one could take exact account of the history of ceramics of all the principal epochs in all the countries which have excelled in this art. There were, indeed, here and there, some gaps, but the collection, as a whole, presented a sufficiently complete view, with which the *savants* and artists could only show themselves well pleased.

H. MEREU.

SALT WATER FOR BIG TOWNS.

AN enormous saving in water would be effected if sea-water were used in all cases where fresh water is not absolutely indispensable, and especially for such purposes as the flushing of sewers and the watering of streets. The advantages to be derived from sea-water for such municipal purposes as the above have frequently struck engineers, and are set forth in a paper read by Mr. S. H. Terry before the Civil and Mechanical Engineers' Society. There have not been wanting schemes for supplying sea-water even to inland towns, but hitherto it has been objected that sea-water, though so abundant, was an expensive commodity to supply to towns, and it has even been asserted that the effect of sea-water on the pavements, for instance, was anything but beneficial. These ideas, however, have now been exploded.

A gallon of sea-water contains about 2,500 grains of saline matter, of which about 1,890 grains are common salt — chloride of sodium — the remaining 610 grains being composed of other salts; and it is due to the deliquescent character of one of these salts, chloride of magnesium, that any material having once been moistened by sea-water remains moist for a considerable period. But, after storms, there is also present in sea-water taken from near the shore, in the vicinity of weed-covered rocks, a considerable amount of organic matter from the destruction of seaweed, and the consequent mixture of its glutinous sap with the water. It is believed that it is to this glutinous material that the formation and endurance of the bubbles of sea-scum, which occasionally, in gales, are driven some distance inland, is due. As, roughly speaking, about 80 pounds' weight of various salts are present in every water-cart containing 224 gallons — one ton — of sea-water, it will be seen that much material, which may or may not be injurious, is, in the course of a few weeks, spread over the streets of a town by the water-cart. This fact had created a feeling that the use of sea-water for streets might not be without its dangers, and Mr. E. Buckham, M. Inst. C. E., Borough Engineer of Ipswich, was so much impressed with it that he instituted inquiries on the subject, and requested information from the engineers of thirty-five coast towns who had used sea-water for watering the streets. Twenty-three of the engineers written to replied that they were no longer using sea-water, as they had no works for that purpose; twelve stated that they were using sea-water, some with suitable works, and some by merely filling the carts by hand; and two that they were about to have works.

The engineers of two towns, Ramsgate and Folkestone, spoke adversely of sea-water, and stated that it destroyed all kinds of road material except wood. Some advised its use for sewer-flushing, if a sufficient volume was employed; others, again, were of opinion that sea-water tended to produce gas when brought into contact with sewage, and should not be used for sewer-flushing except in large volumes. But it is probable that sea-water only produces objectionable effects in sewers when these are particularly foul, and the influx of sea-water stirs up the decomposing matter deposited in them. With regard to the efficiency of sea-water as a means of preventing dust on roads formed of flint, gravel or granite, the testimony of those who have used it is almost entirely in its favor. Indeed, the borough engineer of Berwick-on-Tweed goes so far as to say that all persons having control of street-watering should use sea-water, where it can be had, for reasons of economy, as well as for the comfort of the inhabitants. In his district he finds that one cart of sea-water is equal to two carts of fresh water, and gives more lasting and beneficial results. He states that the macadamized roads that are watered with salt water are a pleasure to drive upon in the summer season, as compared with those watered with fresh water, and they never seem to have a loose stone upon them.

In answer to Mr. Buckham's question, whether sea-water occasions any offensive decay of street refuse, and if so, whether this is greater than that which would be occasioned by rain or fresh-water, the pithy reply was: "No, when the scavenging of the towns is regularly attended to." Without enumerating all the favorable answers that were received, it will suffice to state that the following important seaside resorts reported in favor of sea-water: Portsmouth, Tynemouth, Great Grimsby, Great Yarmouth, Hastings and Littlehampton. Hastings, which has a population of 42,258, and a rateable value of £309,219, has erected very extensive works at the cost of £9,000 for sea-watering, which means a charge of about 3*d.* per head of the population, or ½*d.* on the rateable value. Great Yarmouth, with a population of 46,159, and a rateable value of £133,658, has completed works of salt-water supply for street-watering at a cost of £4,500. Here an 8-horse power Otto Crossley gas-engine has been erected, with a 12-inch pump, engine-house, tower and tank, containing 22,000 gallons, settling-tank and suction-pipe, fixed to the jetty. There are about 9,000 yards of main, ranging from 8 feet to 3 inches cast-iron socketted-pipes, lead-jointed, 40 stand-posts, 12 automatic flushing-syphons — Field's — each connected to tanks holding 2,000 gallons of sewer-flushing.

The total expenses, including interest and capital, repayment of loan in 20 years, depreciation of wages, gas, oil, etc., are under £500 per annum. For this amount some 30,000,000 gallons are raised 44 feet at a cost of 4*d.* per 1,000 gallons. Of this volume about 5,000,000 gallons are used for street-watering and 25,000,000 gallons for sewer-flushing. Before these works were constructed the cost of water for street-watering alone was £404 on an average of each 7 years, ending 1883. In 1885 it was as much as £552. To keep the automatic tanks of the size mentioned properly going the cost would have been £700 per annum. The charge for water at Yarmouth was, at that time, 1*s.* per 1,000 gallons. The cost of watering for street-watering and sewer-flushing, including all items mentioned above, is less than 3*d.* per head per annum, and something under 1*d.* in the pound. At Gosport a similar experiment has been made, with highly satisfactory results. The facts speak eloquently for themselves, and require no further comment. In some cases, however, the water-companies offer a very strenuous opposition to the introduction of sea-water, and Mr. Terry instances the case of Kirkhallerton, near Redcar, on the Yorkshire coast, where a very neat scheme was got out for the supply of sea-water for street-watering, and it was also intended to supply sea-water for bathers to the houses, and but for this intention the scheme would probably have been carried. The law here stepped in, and showed that inasmuch as the district was within the limits of supply of the Stockton and Middlesbrough Water-Works, a loan for such works of proposed supply would be illegal.

The discussion which followed Mr. Terry's paper was nearly all in favor of sea-water. Its employment for the watering of streets, at any rate, is a perfectly practicable idea, and one that can be adopted with economy and success. The increasing size of our towns makes adequate supply of water annually a question of greater and greater difficulty, especially when we remember that with the spread of the scientific spirit of the age cleanliness may be said to be advancing at quite an alarming ratio, and that the demands made on our water-supply for municipal purposes are growing almost daily. In London, this is felt very appreciably, and it would be interesting to see an experiment tried on a large scale of flushing our enormous sewers, and watering our interminable streets with sea-water. For this purpose London is more favorably situated than any other capital in Europe almost. Constantinople and Lisbon perhaps alone excepted. At any rate, there is a strong feeling that something must be done, and that speedily; and Mr. Terry's paper may, therefore, be received as containing what, at least, appears to be a very practical suggestion, and possessing, moreover, the merit of being, as far as we know, the first attempt to bring together in an accessible form all the *pros* and *cons*, and experience and practice connected with the subject. The moderate cost of the pipes necessary for supplying even a large town places the proposal very easily within the reach of realization. — *Engineering.*

REPORT OF THE COMMISSIONERS FOR THE EXHIBITION OF 1851.

THE Commissioners have just issued their seventh report, which brings the account of their proceedings down to the present time. The number of institutions now standing on the estate of the Commissioners is as follows:

1. The South Kensington Museum, the School of Science, and the Department of Science and Art.
2. The Natural History Museum.
3. The India Museum.
4. The Patent Museum.
5. The Museum of Scientific Instruments.
6. The Royal Albert Hall.
7. The Central Technical Institution.
8. The Royal College of Music.
9. The Imperial Institute.
10. The Royal School of Art-Needlework.
11. The Alexandra Home for Female Students.
12. The Museum of the Fish Culture.
13. The Anthropological Laboratory.
14. The School of Art Wood-carving.
15. The Home Arts and Industries Association.
16. The School of Cookery (*now removing*).

The Commissioners give the following account of the amount of their contributions to public purposes:

"In our last report we mentioned that the result of the Exhibition of 1851 left us in possession of a sum of £186,000, and we showed that the continual increase in the value of our estate had already enabled us to contribute to public purposes money and property amounting to nearly half a million. We have since the date of that report allotted, as above reported, for the Central Technical Institution, a site valued at £40,000; to the Alexandra Homes a site valued at £10,000; to the Royal College of Music a site valued at £45,000; and to the Imperial Institute a site the value of which cannot be estimated at less than £250,000. In addition to these grants of land, we have by our annual subscription of £500 a year to the Royal College of Music, provided a sum of £3,000 for musical education."

The conclusions of the report are thus summarised.

"We have mentioned the non-acceptance by her Majesty's Government of our offer to provide a building for a Museum of Science, and the steps which we have subsequently taken in the hope of inducing the Government to establish on our estate those institutions ancillary to the teaching of science which are necessary to form a complete system of scientific education for this metropolis. We have referred to the circumstances which compelled us to put an end to the connection between the Royal Horticultural Society and our estate, and have narrated the steps taken to recover possession of the gardens from the society, and the uses to which that portion of the estate has been subsequently put. We have given detailed accounts of the establishment on our estate, since our last report, of the Central Technical Institution, the Royal College of Music, the Alexandra Homes, and the Imperial Institute, and have also explained the relations which have existed between us and the various bodies accommodated on our estate. We have reported the various other dealings with the estate since the date of our last report, and have submitted statement showing our financial position. We have also submitted our proposals for the future, which are in effect the raising of a considerable free income by alloting for private building purposes part of the northern portion of the central quadrangle of our estate, while reserving in our hands sufficient space for the development of the Science and Art Department, and the foundation, from part of the surplus income thus obtained, of scholarships for the purpose of assisting provincial technical institutions of science and art, and connecting them, if they desire it, with the larger schools and colleges which exist in the metropolis.

"The experience of recent years has convinced us that a substantial disposable income will enable us to work more usefully in this and other directions for the public benefit than would the mere ownership of unproductive land. While we have always kept in view the original objects of our trust, the remarkable increase in the value of the estate which was secured to us by the wise forethought of his Royal Highness the Prince Consort, our first president, has enabled us to give a wider scope to our work than could have been anticipated from the amount of the fund which the success of the Exhibition of 1851 placed in our hands. The profits of that Exhibition were derived from national and not simply metropolitan co-operation, and we believe that we carry out the wishes of its royal founder when we propose to realize part of our property for national purposes." — *Journal of the Science of Arts.*

The Longitudinal Expansion of Wood. — After immersion in water for thirty-seven days, specimens of pine were found by Prof. D. V. Wood to have been lengthened 0.065 per cent, oak 0.085 per cent, and chestnut 0.165 per cent, the lateral swelling being 2.6 per cent for pine, 3.5 per cent for oak, and 3.65 per cent for chestnut. — *Worcester Gazette.*

SOCIETIES

BOSTON ARCHITECTURAL CLUB. — ANNOUNCEMENT.

THE Directory has announced to the members of the Club the plans for the coming year's work, so far as any such have been decided upon. The absence of so many members from the city during the summer has made it seem inexpedient to hold any meetings at all, but the Club work will be entered upon during the present month, and opportunities afforded for re-union and study.

CONVERSAZIONI.

The informal conversazioni which proved so interesting during the past year are to be renewed, one such meeting being held every week, devoted to informal lectures, discussions, or social gatherings. Several parties have volunteered to lead meetings, and the names and topics will be announced subsequently. It is intended to mingle with the purely architectural topics some consideration of the practical details of the profession, such as steam-heating, superintendence, iron-work, and the like, as it is believed that many of the members will be profited by the study of such themes.

LECTURES.

Professor Ware has kindly loaned to the Club his entire magnificent collection of lantern slides, amounting to, in all, over 700. Mr. C. Howard Walker has consented to deliver a series of informal talks upon the History of Architecture, illustrated by these lantern slides. There will be one such lecture on the first Wednesday of each month, beginning with October and extending to April.

Besides these, several of the best known authorities on art and architecture have been informally spoken to, and it is hoped that arrangements can be made by which a series of public lectures can be given under the auspices of The Boston Architectural Club.

There are several other lecture features which it is intended to develop during the winter, but which are not sufficiently elaborated for public notice.

EXHIBITIONS.

As in the previous year, it is intended to hold an exhibition of some sort every month, and six of these are already partially provided for, and will be announced later.

It was thought best last year not to attempt any general exhibition of architectural drawings. Arrangements are already in progress for an annual exhibition to be held by the Club early next May.

CLASSES.

It is intended to establish, the coming year, one or two Life and Water-Color Classes, the instructors for which have not as yet been decided upon; a Pen-and-Ink Class under the direction of Mr. Gregg, and a Sketch Class, the direction of which will be left to the members.

As has already been informally announced it is the intention to establish special classes for the benefit of those members of the Club who are intending to compete for the Rotch Travelling-scholarship. Instruction will be given in Design and Planning, on the system followed in the Ecole des Beaux-Arts. Also in the History of Architecture, Construction, Perspective, Cast Drawing, and Modelling.

If possible, an arrangement will be made by which members of the Club who desire instruction in French or German can obtain such at reduced prices.

The Directory is looking forward to a very satisfactory year. The Club is entirely free from debt, has an active membership of over 150, and there is no reason why it should not make, this year, a name for itself.

COMMUNICATIONS

[The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.]

A CORRECTION.

SAN FRANCISCO, CAL., August 31, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — The Presbyterian Church at Liberty, Mo., was built from the plans of W. W. Polk & Son, of Kansas City, and not, as you were led to believe by me, possibly from the fact that the drawing that you published bore my signature as the delineator. A sketch plan of the church having the firm name upon it was intended for publication, but was lost, and I was unable to reproduce it, owing to the change of my location. I ask this correction in justice to my father.

Very truly yours, WILLIS POLK.

CONTINUOUS BEAMS.

ANNAPOLIS, MD., September 1, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In the case of three parallel walls, making two spans of say 15′ each, would you advise the use of continuous rolled-iron beams, or is it better to have the beams independent for each span? I should think an answer to this query would interest many readers of the *American Architect.* Yours truly, H. DALMON.

[CONTINUOUS beams would be both stronger and stiffer, but they might cost more than independent beams of the same dimensions. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

SAWING STONE BY HELICOIDAL WIRE-CORD. — In place of the ordinary method of sawing stone, a new plan of cutting by means of wire-cord has been adopted. While retaining sand as the cutting agent, M. Paulin Gay, of Marseilles, has succeeded in applying it by mechanical means, and as continuously as the sand-blast and band-saw, with both of which appliances his system — that of the "helicoidal wire-cord" — has considerable analogy. An engine puts in motion a continuous wire cord (varying from 5-32 to 7-32 of an inch in diameter, according to the work), composed of three mild-steel wires twisted at a certain pitch, that found to give the best result in practice, at a speed of 15 to 17 feet per second, the higher speed being adopted for the smaller diameter. Instead of the stone being brought to the saw, the wire-cord, which may be of indefinite length, is led to the stone, being guided by grooved pulleys, mounted on bearings with universal joint, which permits of their adapting themselves to any change of direction. The same cord, which is kept at uniform tension by a weighted truck on an inclined plane, may act upon any number of blocks, provided sufficient space be given between them to allow for cooling. The pulleys are mounted in standards, and are fed down by endless screws rotated automatically if the stone be uniform, but preferably by hand if there is reason to suspect irregularities in its texture. Sand and water is allowed to flow freely into the cuts, the sand carried along by the cord in the spiral interstices between the wires causing a uniform attrition of the stone. The twist of the cord causes it, while travelling, to turn upon itself, and thus become worn evenly. A cord of average length, say 150 yards, will cut about 70 feet deep in blocks 15 feet long, or produce 490 square feet of sawn surface before being worn out, when it may be used for fencing. The sand must be sharp, and not used more than three times. The nature of the sand is determined by the hardness of the stone; thus, quartz sand will cut granite and porphyry, which it has hitherto been found impossible to saw, or indeed cut in any other way than by pick or chisel. An hourly advance of 1 inch in granite or porphyry, and 4 inches in marble, is regularly obtained in blocks of 15 or 16 feet long. At the Brussels Exhibition of last year, where the system was awarded a First Prize of Progress, the same cord which cut marble also cut a block of concrete composed of quartz pebbles. Not merely does the helicoidal cord saw blocks of stone, but it even cuts them out of solid rock in the quarry. To do this it is necessary to sink shafts of 2 feet or 2 feet 6 inches in diameter, in order to introduce the pulley carriers. If there is a free side to start from, one shaft is sufficient for a triangular block; but for a quadrangular one, which is preferable, two shafts are necessary. They are bored by a mechanical perforator, consisting of a hollow plate-iron cylinder, having at its lower end a slightly thicker collar which acts with sand and water in its latest development. The cylinder is made to revolve at a speed of 140 revolutions a minute, by means of a tele-dynamic cable, advancing about an inch per hour in marble. An annular space is cut in the rock, leaving a core, which may be utilized as a column. The diameter of the shaftway depends upon the diameter of columns most in demand, provided a sufficient number be sunk, and the intervening angles broken down, so as to afford sufficient room for the pulley carrier. In the case of stratified rocks, the shaft-cuts are carried down to a natural parting; but in unstratified rocks a nearly horizontal cut may be made with the cord, sufficient inclination being given to insure the flow of sand and water to the bottom of the cut. Such is the method of working practised at the Traigneaux Quarry, near Phillippeville, in Belgium, where 15,000 cubic feet of marble are extracted yearly with 30 horse-power engine, and only 30 hands in summer and 20 in winter, besides the lads who tend the wire-cords. The system is also employed at granite and marble quarries in France, Germany, Spain, Italy, Algeria, Tunis, and other countries, where it is said to be giving satisfactory and economical results. — *Journal of the Society of Arts.*

STEALING JULIET'S TOMB. — Of the strange fortunes that may come to men of great name after death, many authors have written. Sir Thomas Browne tells us that "the Egyptian mummies, which Cambyses or time hath spared, avarice now consumeth. Mummy is become merchandise, Mizraim cures wounds, and Pharaoh is sold for balsams." That may account for the disappearance of a dead body, but some other feeling must actuate those who carry away part of a tomb. One of the choicest attractions of Verona for strangers, especially for those who know the works of Shakespeare, is the so-called tomb of Juliet in the garden of the Franciscan nuns, in the vicinity of the swift-flowing Adige. A large portion — no less than six pounds' weight — of this tomb was broken off, and was almost carried away by a person described as an Englishman. The story, as told in the Verona papers, relates that an English lady and gentleman went to visit the tomb of Juliet and Romeo three or four days ago. Before leaving the spot the Englishman handed a note of 10f. to the custodian of the place, in order that the ordinary fee might be deducted and the change handed to the visitor. While the custodian searched in his pockets for change the tourist produced a hammer from his pocket, and by a sharp blow on

the rude sarcophagus of red Verona marble, which is said to have enshrined Juliet, broke off a piece of about three kilogrammes, or six pounds in weight. Then he moved away rapidly from the scene of destruction and desecration. The custodian, who had observed the deed, pursued him and suggested the propriety of his giving up the plunder. The Englishman protested, and it was only after a lengthened debate that the visitor finally delivered up the fragment broken off the Juliet sarcophagus. Such is the story now going the round of the papers. In Gustave Doré's illustrations to "*L'Espagne*" of Baron Davillier there is an illustration entitled "The robbers of *azulejos* (tiles) at the Alhambra," representing an Englishman of the Continental type, accompanied by his wife, and engaged in hammering off the colored tiles from the walls of that incomparable building. This is the idea that many French and Spanish and Italian people have of the Englishman abroad. The report of the attempt to carry off three kilogrammes of Juliet's tomb will confirm the old idea. It matters but little that no one who knows the history of the place regards the tomb as genuine: for the people of Verona it is at least as effective in inducing strangers to visit their city as if it were the indisputable sepulchre of the unfortunate daughter of the Capulets. Murray notes that "it certainly was shown in the last century, before Shakespeare became generally known to the Italians. . . . Maria Louisa got a bit of it, which she caused to be divided into hearts and gems, elegant necklaces, bracelets, etc., and many other sentimental young and elderly ladies have followed her Majesty's example." It is all very well for a royal personage, such as Maria Louisa, to get a bit of this troughlike tomb; but an unknown English traveller who attempts to carry off six pounds of red marble in a surreptitious manner, even for the gratification of sentiment, is treated with scorn by the journalists of the whole country, and deservedly so. — *Glasgow Herald.*

Fibre vs. Hair in Mortar. — Various tests have been made with a view to ascertaining the advantage to be derived from the use of manilla fibre, as compared with other substances, in plastering work. One of the most conclusive of these tests was made with four plates of equal size, one containing manilla hemp, a second sisal hemp, a third jute, and a fourth goat's hair of the finest quality, and the operation consisted in suspending weights from the middle of each plate, the ends of which were properly supported. The result showed that the plaster mixed with goat's hair broke at 144 1-2 pounds weight, the jute at 145 pounds, the sisal at 150, and the manilla at 195 — in the latter case the hemp not breaking, but cracking, and, though cracked in the centre, the lower half of this plate, when it was suspended, held on to the upper half, the manilla securing it fast. The three other plates were broken — that is, the two parts of each plate had severed entirely, in contrast with the manilla plastering. Another experiment consisted in mixing two barrelfuls of mortar, each containing equal portions by measure of sharp sand and Thomaston lime, one of the barrels, however, being mixed with the proper quantity, by measure, of manilla hemp, cut in lengths of one and a half to two inches, and the other of best goat's hair. On being thoroughly mixed with the usual quantity of water, the respective mixtures were put in the barrels and stored away in a dry cellar, remaining unopened for nine months, when, on examination, the hair mortar crumbled and broke apart, very little of the hair being visible, showing that it had been consumed by the lime; but the other, containing the hemp, showed great cohesion, it being quite an effort to pull it apart, the hemp fibres permeating the mass, and showing little or no evidence of any injury done to it by the lime. — *Providence Journal.*

The Camera a Witness in a Suit for Damages. — A civil engineer in charge of important work nowadays must be something of a diplomat and lawyer, as well as a master of his own calling, and must, to use a cant phrases have eyes in the back of his head. As the Denver *Republican* recently said, a good engineer can save his salary ten times over. One instance showing the forethought required, may be cited from the work upon the London Southwark subway or tunnel under the Thames. This work is three miles long and has been in progress for three years. Recently, after the tunnel had passed, some householders in buildings overhead discovered cracks in their walls, for which they promptly demanded damages. When the case came to be heard, the engineer produced photographs of the walls in question taken before the tunnel workings reached them, and showed that the cracks complained of were old ones. It seemed that the engineer, as a measure of precaution, had carefully photographed every wall and building likely to be affected by the excavations for the tunnel. — *Mechanical News.*

Slate an Unsafe Roofing for Mills. — A writer in the *Milling World* says: "Slate is not a safe material for mill roofs. Not long ago, I saw a slate-roofed mill fired by heat from an adjoining burning building. The heat cracked the slates and they ran off the roof in a shower, leaving dry wood exposed to the flames. Another building covered with shingles was equally exposed, and singularly enough the roof of the slate-covered mill took fire before the roof of the shingle-covered building. The streams of water turned on the slates after they became hot caused their rapid destruction, while the wetted shingles were kept from burning. The slate roof allowed streams of water to drip downward through the entire building, while the shingle roof protected the building which it covered. Slate roofs may prevent fires from floating sparks, and shingle roofs when very dry may invite fires from such sparks; but where buildings are crowded closely together almost any one of the roofing materials is better and safer than slate, because in the case of crowded buildings the slate is exposed to heat sufficient to break it and uncover the wood."

The North River Tunnel. — Work has just been resumed on the submarine tunnel to connect New York with Jersey City. The tunnel will extend from the foot of Morton Street on the New York side to a point between the Delaware, Lackawanna & Western and the Erie Railway's termini on the New Jersey shore, and it is hoped to have it completed within three years. The system will consist of two independent tunnels, known as the north and south tunnels. The actual length of each tunnel will be 5,600 feet. In addition to this there will be an approach of three-fourths of a mile on each side, making a total length of over two and a half miles for each tunnel. The approaches to both tunnels will consist of a single large arch. Some preliminary work upon the tunnel was done in 1873. In 1879 work was resumed, and a shaft sunk. The operations stopped in 1882. Then the work on the New Jersey end of the north tunnel was completed for 1,500 feet, and on the south tunnel for 500 feet. On the New York side there were seventy-five feet completed on the north tunnel, and none on the south tunnel. Two years ago 305 feet were added on the New Jersey side of the north tunnel. This, with some other slight additions, made a total of 2,000 feet on the north tunnel and 585 feet on the south tunnel. At present there is a force of about 150 workmen, and this number will doubtless be increased in the near future. The rate of progress at present is from two to five feet each day, but with improved methods of tunnelling it is expected that this rate will be largely increased. — *Exchange.*

TRADE SURVEYS

The rushing activity in nearly all trade and manufacturing channels is due as much to confidence as to crops. In speculative channels there is an upward movement. Anthracite coal stocks have been selling at unprecedently high figures. September disbursements and treasury distributions have given a stronger tone to the money market than has been felt for years. The August bond purchases this year were $14,791,000, as against $6,000,370 for August, 1888. Then the fact that the trunk-line roads report their rolling-stock taxed to its utmost capacity also helps to strengthen confidence. All these things have stimulated the movement among Western trunk-line managers to establish a railway trust, which, honest as may their intentions be, they will fail to accomplish. A reference to the iron trade is necessary at this time. Present capacity is fully taxed. Pig-iron production, enormous as it is, is no more than sufficient for current requirements. Prices have hardened to the advancing point. The bar, plate, sheet and pipe mills are barely able to keep customers supplied. New works, involving the purchase of large iron and steel supplies, are heard of in all directions. Bridge work is crowding. Ship-building requirements are increasing. The effort of the Government to buy ships below cost has failed. Car-builders are soliciting car-building contracts from the railway companies for the coming winter, with good promise. The industries, big and little, are all picking up work. Rolling-mill plants are being extended. Recently, several pig-iron furnaces have blown in, and new furnaces are projected. In the coal trade a rushing demand has set in for bituminous. Coke will be advanced probably, on October 1, to $1.50 at ovens. Since July 1, one thousand additional ovens have been projected. In lumber business is reported as dragging, because more lumber has been prepared and sent to market than there is immediate demand for, but the distribution is simply enormous. In machinery, there never was such a vigorous demand. A vast amount of old machinery is being removed to make room for improvements and improved processes. Shops in the New England and Middle States are making over-time in scores of instances. Instances of extraordinary activity might be multiplied. There are no danger signals in the commercial field. Bank clearings, last week, were one-third greater than for corresponding week last year, according to bank returns. In foreign financial circles there is no uneasiness. The Bank of France has gained fifty millions in gold in a year, if the statement can be credited; while the Bank of England's gold has declined, as is to be expected. This decline will probably continue. In fact, the position of the Bank of England as a financial umpire will be more or less jeopardized in the near future through the tendency of capital to vacate its old haunts for better returns.

The jobbing interests of Boston and New York are qualified to express creditable trade opinions. The general sentiment is that the volume of business for the next six months will be 20 to 25 per cent greater, as exhibited by clearing-house returns, than for the six months between the autumn of 1888 and spring of 1889. The makers of agricultural implements and machinery never had such a rush of business as now. Barbed-wire sales are heavy. Stocks of farm implements are light, and the preparations being made this season for an extension of agricultural area next year denotes a confidence that means heavy purchases throughout the West and Northwest. Trade combinations are finding themselves in shoal water. The copper trust, after patching up its craft, is about going to pieces again. The tin-plate combinations have all been swallowed up in defeat, and the manufacturers are now in distress at the evidences of coming competition from American tin-plate-making enterprise. The tendency long ago pointed out in this column with reference to the eventual equalization of the cost of labor between different countries and people, is now manifesting itself in foreign lands. Hosiery manufacturers claim that the advance at several foreign centres, coupled with honest custom-house appraisement at home, is making it possible to turn out goods at a profit which could not be touched a year ago. The carpet trade is in a prosperous condition, but the loom-capacity is so great that prices have not been advanced. The woolen interests are still at war with the wool interests; cotton-goods manufacturing is less remunerative than for years, but an adjustment is now in progress that will result in a wiser diversification of product. The silk-culture people are pushing through numerous discouragements, the chief of which is the anxiety of those experimenting to reap handsome returns the first or second year. Ramie culture is receiving more quiet attention. The textile-manufacturing interests are thriving under difficulties, and in the opinion of some who have their entire interests in this one field, there is a grand future for textile-goods manufacturers. Hosiery mills are springing up in new localities West and South. Woolen mills are projected for nearer home wool sources than New England, but the future centre of the woolen-goods industry is uncertain. A contest on tariff-duties is looming up, and the contest will not be confined to one article. A considerable element is favorable to an enlarged free list, and the entire tariff discussion will ere long be renewed upon a new basis. The rapid settling up of the country, and our increasing interest in an export trade, are true factors which will bring new elements into the discussion. There are increasing difficulties also among the masses of voters, who will not be able to understand why wages should decline under high duties. The manufacturing interests of the Middle States recognize impending dangers, and are preparing for them.

S. J. Parkhill & Co., Printers, Boston.

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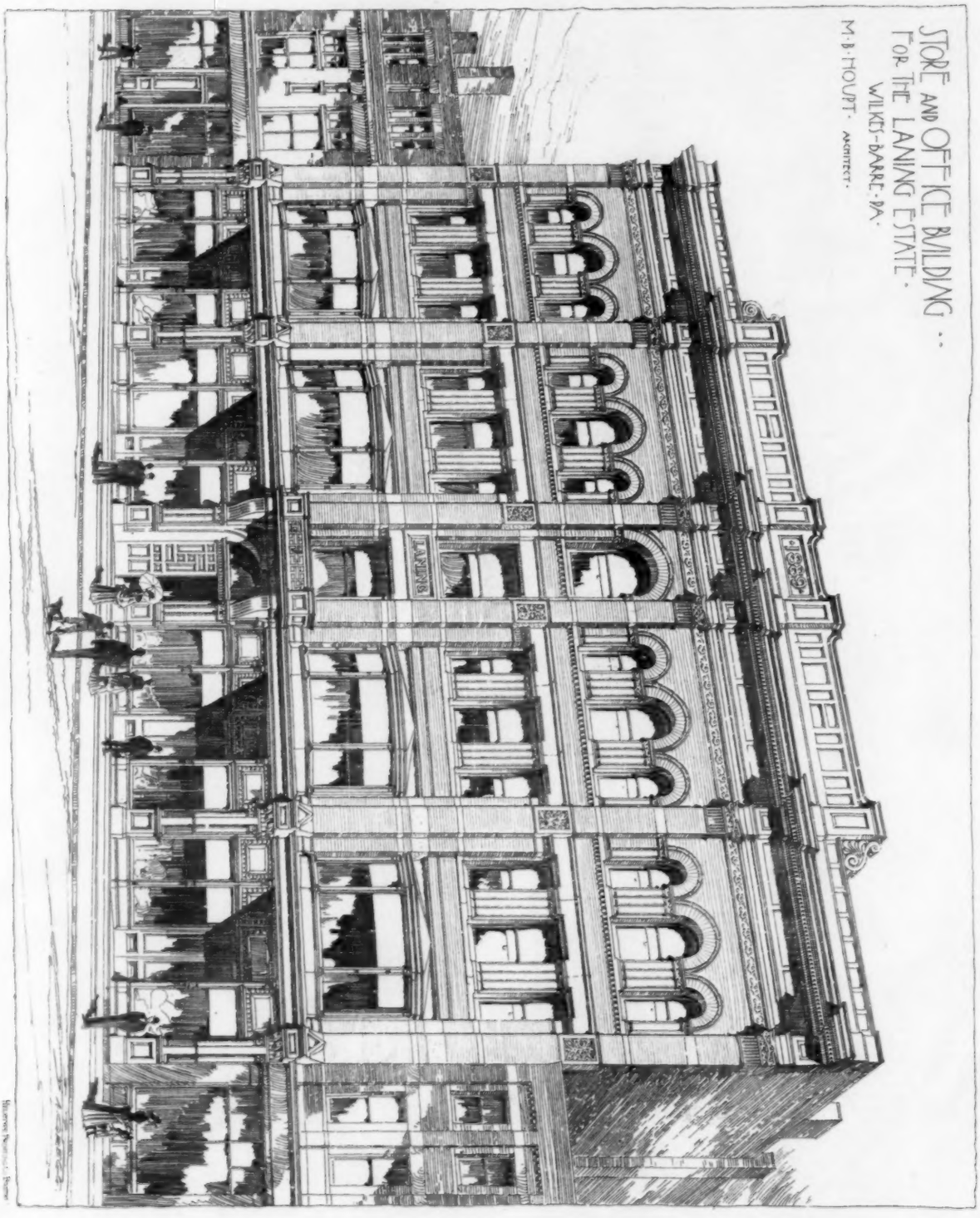
STORE AND OFFICE BUILDING ::
FOR THE LANING ESTATE.
WILKES-BARRE, PA.
M. B. HOUPT, ARCHITECT.



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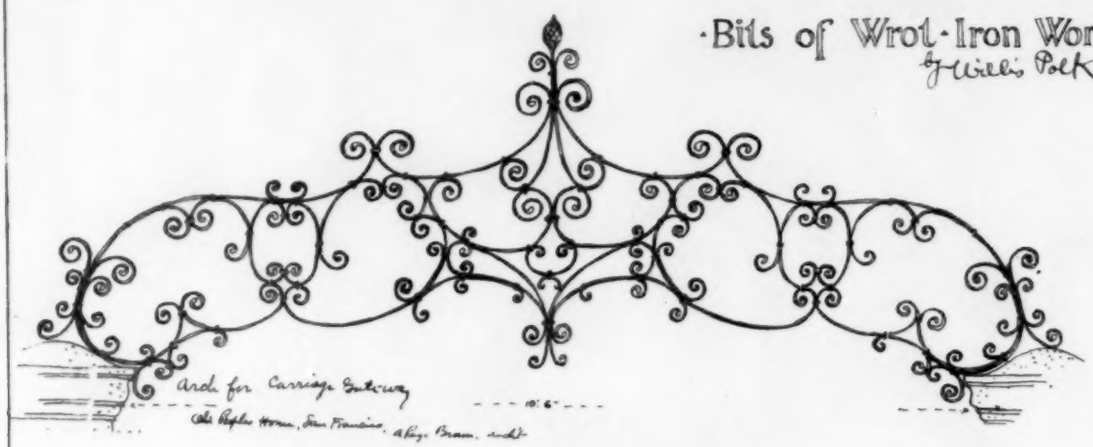
Bits of Wrot-Iron Work

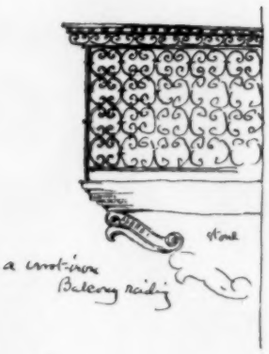
by Willis Polk.



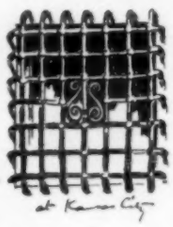
Arch for Carriage Entrance

Old Pioneer Home, San Francisco. Alley, Brown, Architect

City of Mexico 1887

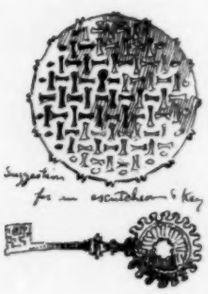


A wrot-iron Balcony railing



St. Louis

St. Louis Burglar



Suggestion for an escutcheon & key

A suggestion

Old Pioneer Home San Francisco

Clarke & Bro. N.Y.

Photolithographed by Photolithographic Printing Co., Boston.

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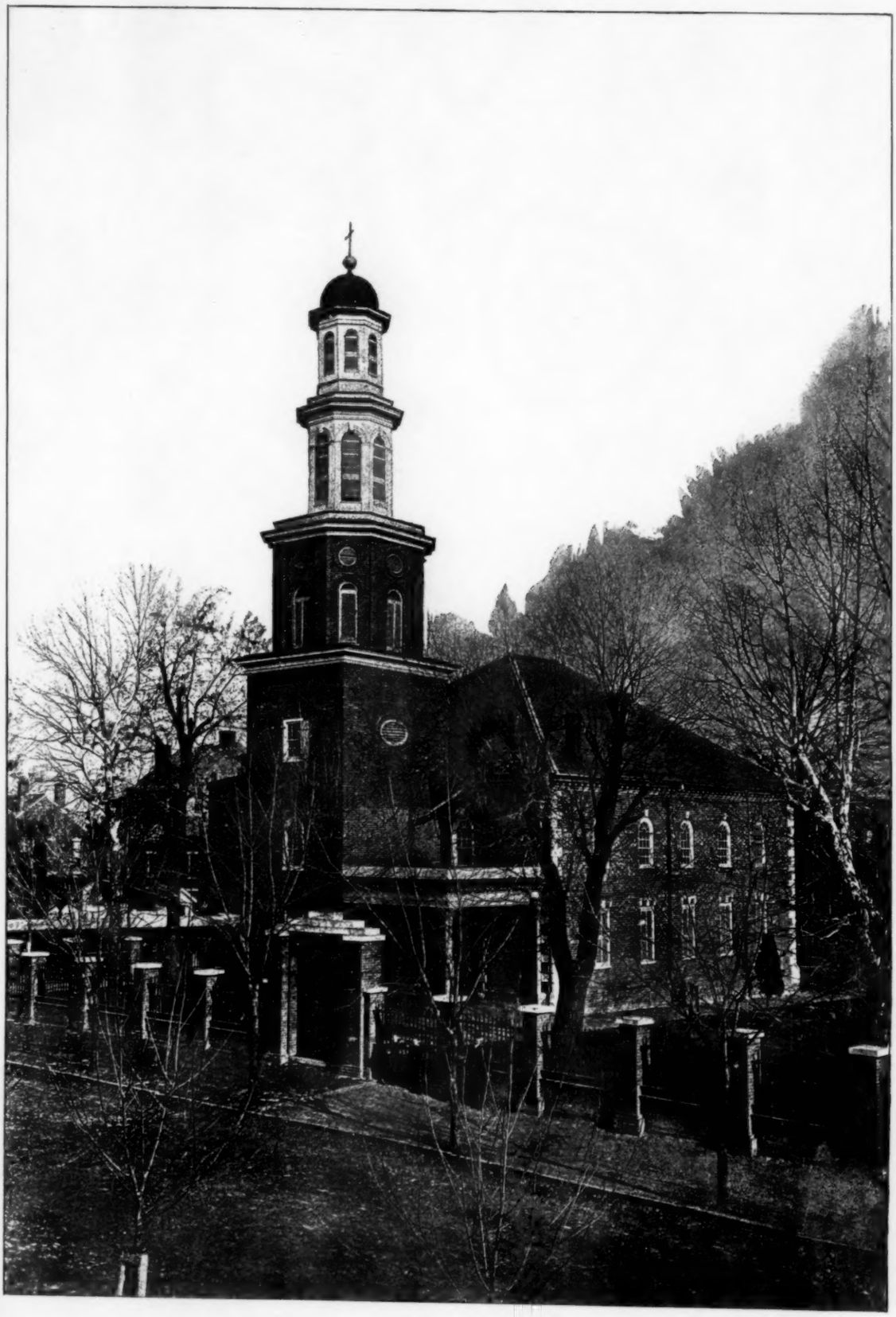

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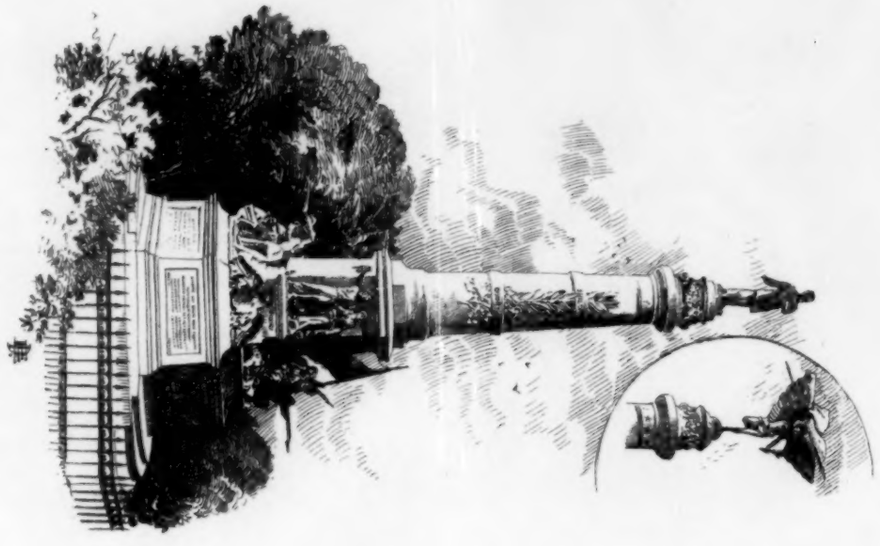

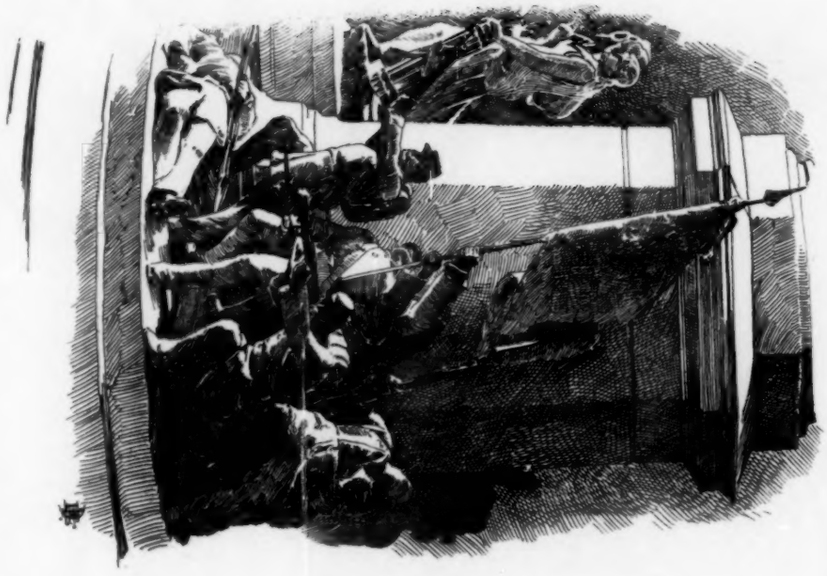

Second Prize Design for the Iowa State Soldiers' Monument . . . Robert Kraus Sculptor.

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Rochester Architectural Sketch Club.

"Arnaa."

First Place. Edwin S. Gordon.

R. A. S. C. Competition.

'Coin.'

Second Place. — W. H. Orchard.

Section.

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